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PART III

ENVIRONMENTAL PROTECTION AGENCY

■

CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES

Republication of the 1977, 1978, and 1979 Model Year Motor Vehicle Certification Regulations

Title 40—Protection of Environment

[FRL 748-6]

CHAPTER I—ENVIRONMENTAL PROTECTION AGENCY

PART 86—CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES

Republication of the 1977, 1978, and 1979 Model Year Motor Vehicle Certification Regulations

AGENCY: Environmental Protection Agency.

ACTION: Final rule.

SUMMARY: This action is a republication of the 1977 model year motor vehicle certification regulations, a publication of the complete 1978 model year motor vehicle certification regulations, and a publication of the existing 1979 model year motor vehicle certification regulations. This publication is being issued to provide the public with complete, updated 1977, 1978, and 1979 model year motor vehicle certification regulations to aid in the use of those regulations. This action is needed due to the numerous amendments that have been made to the regulations since they were last published in their complete form (July 1, 1976 edition of the Code of Federal Regulations, Title 40, Parts 60 to 99). This document does not make any changes to the existing motor vehicle certification requirements.

EFFECTIVE DATE: These amendments are effective June 28, 1977.

FOR FURTHER INFORMATION CONTACT:

David A. Finley, Regulatory Management Staff, Mobile Source Air Pollution Control (AW-455), Environmental Protection Agency, 401 M Street, S.W., Washington, D.C. 20460, (202) 755-0596.

SUPPLEMENTARY INFORMATION: The Agency finds good cause to omit as unnecessary a notice of proposed rulemaking and public rulemaking procedure in the issuance of these regulations. These regulations are a recodification of existing regulatory requirements, applicable to 1977, 1978 and 1979 model year certification. For the same reasons, the Agency finds good cause to make these regulations effective on the date of publication in the FEDERAL REGISTER.

NOTE.—The Environmental Protection Agency has determined that this document does not contain a major regulation requiring preparation of an Economic Impact Statement under Executive Order 11821, as amended by Executive Order 11949, and under OMB Circular A-107.

Dated: June 14, 1977.

EDWARD F. TUERK,
Acting Assistant Administrator for Air and Waste Management.

40 CFR Part 86 is amended by revising Subpart A, Subpart B, and Appendices I through VI, to read as follows:

Subpart A—General Provisions for Emission Regulations for 1977 and Later Model Year New Light-Duty Vehicles, 1977 and Later Model Year New Light-Duty Trucks, and for 1977 and Later Model Year New Heavy-Duty Engines

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AUTHORITY: Secs. 202, 206, 207, 208, 301(a) of the Clean Air Act, as amended (42 U.S.C. 1857f–1, 1857f–5, 1857f–5a, 1857f–6, 1857g(a)).

Subpart A—General Provisions for Emission Regulations for 1977 and Later Model Year New Light-Duty Vehicles, 1977 and Later Model Year New Light-Duty Trucks, and for 1977 and Later Model Year New Heavy-Duty Engines

§ 86.077–1 General applicability.

The provisions of this subpart are applicable to 1977 and later model year new gasoline-fueled and Diesel light-duty vehicles, 1977 and later model year new gasoline-fueled and Diesel light-duty trucks and 1977 and later model year new gasoline-fueled and Diesel heavy-duty engines.

§ 86.077–2 Definitions.

(a) The definitions in this section apply to this subpart and also to Subparts B, H, I, and J.

(b) As used in this subpart all terms not defined herein shall have the meaning given them in the Act:

"Act" means Part A of title II of the Clean Air Act, 42 U.S.C. 1857 f–1 through f–7, as amended by Pub. L. 91–604.

"Administrator" means the Administrator of the Environmental Protection Agency or his authorized representative.

"Auxiliary Emission Control Device (AECD)" means any element of design which senses temperature, vehicle speed, engine RPM, transmission gear, manifold vacuum, or any other parameter for the purpose of activating, modulating, delaying, or deactivating the operation of any part of the emission control system.

"Calibrating gas" means a gas of known concentration which is used to establish the response curve of an analyzer.

"Configuration" means a subclassification of an engine-system combination on the basis of engine code, inertia weight class, transmission type and gear ratios, rear axle ratio, and other parameters which may be designated by the Administrator.

"Crankcase emissions" means airborne substances emitted to the atmosphere from any portion of the engine crankcase ventilation or lubrication systems.

"Defeat Device" means an AECD that reduces the effectiveness of the emission control system under conditions which may reasonably be expected to be encountered in normal urban vehicle operation and use, unless (1) such conditions are substantially included in the Federal emission test procedure, or (2) the need for the AECD is justified in terms of protecting the vehicle against damage or accident, or (3) the AECD does not go beyond the requirements of engine starting.

"Diurnal breathing loss" means fuel evaporative emissions as a result of the daily range in temperature to which the fuel system is exposed.

"Engine family" means the basic classification unit of a manufacturer's product line used for the purpose of test fleet selection and determined in accordance with § 86.077–24.

"Engine-system combination" means an engine family-exhaust emission control system-fuel evaporative emission control system (where applicable) combination.

"EPA Enforcement Officer" means any officer or employee of the Environmental Protection Agency so designated in writing by the Administrator (or by his designee).

"Exhaust emissions" means substances emitted to the atmosphere from any opening downstream from the exhaust port of a motor vehicle engine.

"Fuel evaporative emissions" means vaporized fuel emitted into the atmosphere from the fuel system of a motor vehicle.

"Fuel system" means the combination of fuel tank, fuel pump, fuel lines, and carburetor, or fuel injection components, and includes all fuel system vents and fuel evaporative emission control systems.

"Gross vehicle weight" means the manufacturer's gross weight rating for the individual vehicle.

"Heavy-duty vehicle" means any motor vehicle either designed primarily for transportation of property and rated at more than 6,000 pounds GVW or designed primarily for transportation of persons and having a capacity of more than 12 persons.

"Heavy-duty engine" means any engine which the engine manufacturer could reasonably expect to be used for motive power in a heavy duty vehicle.

"High-altitude" means any elevation over 1219 meters (4000 feet).

"High-altitude conditions" means a test altitude of 1585 meters (5200 feet), plus or minus 274 meters (900 feet), or equivalent observed barometric test conditions of 83.48 kPa (24.72 inches Hg), plus or minus 2.77 kPa (0.82 inches Hg): *Provided*, That the Administrator may approve conditions other than those specified herein on the basis of a written application by the manufacturer.

"Hot soak loss" means fuel evaporative emissions during the 1-hour hot soak period which begins immediately after the engine is turned off.

"Intermediate speed" means the peak torque speed or 60 percent of rated speed, whichever is higher.

"Light-duty truck" means any motor vehicle rated at 6,000 pounds GVW or less, which is designed primarily for purposes of transportation of property or is a derivative of such a vehicle, or is available with special features enabling off-street or off-highway operation and use.

"Light-duty vehicle' means a passenger car or passenger car derivative capable of seating 12 passengers or less.

"Loaded vehicle weight" means the vehicle curb weight of a light-duty vehicle or light-duty truck plus 300 pounds.

"Maximum rated horsepower" means the maximum brake horsepower output of an engine as stated by the manufacturer in his sales and service literature and his application for certification under § 86.077–21.

"Maximum rated torque" means the maximum torque produced by an engine as stated by the manufacturer in his sales and service literature and his application for certification under § 86.077–21.

"Military engine" means any engine manufactured solely for the Department of Defense to meet military specifications.

"Model year" means the manufacturer's annual production period (as determined by the Administrator) which includes January 1 of such calendar year: *Provided*, That if the manufacturer has no annual production period, the term "model year" shall mean the calendar year.

"Nominal fuel tank capacity" means the volume of the fuel tank, specified by the manufacturer to the nearest tenth of a U.S. gallon, which may be filled with fuel from the fuel tank filler inlet.

"Opacity" means the fraction of a beam of light, expressed in percent, which fails to penetrate a plume of smoke.

"Oxides of nitrogen" means the sum of the nitric oxide and nitrogen dioxide contained in a gas sample as if the nitric oxide were in the form of nitrogen dioxide.

"Peak torque speed" means the speed at which an engine develops maximum torque.

"Percent load" means the fraction of the maximum available torque at a specified engine speed.

"Rated speed" means the speed at which the manufacturer specifies the maximum rated horsepower of an engine.

"Running loss" means fuel evaporative emissions resulting from an average trip

in an urban area or the simulation of such a trip.

"Scheduled maintenance" means any adjustment, repair, removal, disassembly, cleaning, or replacement of vehicle components or systems which is performed on a periodic basis to prevent part failure or vehicle (if the engine were installed in a vehicle) malfunction.

"Smoke" means the matter in the exhaust emissions which obscures the transmission of light.

"Span gas" means a gas of known concentration which is used routinely to set the output level of an analyzer.

"System" includes any motor vehicle engine modification which controls or causes the reduction of substances emitted from motor vehicles.

"Tank fuel volume" means the volume of fuel in the fuel tank(s), which is determined by multiplying the manufacturer's nominal tanks(s) capacity by 0.40, the result being rounded using ASTM E29–67 to the nearest tenth of a U.S. gallon.

"Throttle" means the mechanical linkage which either directly or indirectly controls the fuel flow to the engine.

"Unscheduled maintenance" means any adjustment, repair, removal, disassembly, cleaning, or replacement of vehicle components or systems which is performed to correct a part failure or vehicle (if the engine were installed in a vehicle) malfunction.

"Useful life" means:

(1) For light-duty vehicles and light-duty trucks a period of use of 5 years or 50,000 miles, whichever first occurs.

(2) For gasoline-fueled heavy-duty engines a period of use of 5 years or 50,000 miles of vehicle operation or 1,500 hours of engine operation (or an equivalent period of 1,500 hours of dynamometer operation), whichever first occurs.

(3) For Diesel heavy-duty engines a period of use of 5 years or 100,000 miles of vehicle operation or 3,000 hours of engine operation (or an equivalent period of 1,000 hours of dynamometer operation), whichever first occurs.

"Vehicle curb weight" means the actual or the manufacturer's estimated weight of the vehicle in operational status with all standard equipment, and weight of fuel at nominal tank capacity, and the weight of optional equipment computed in accordance with § 86.077–24.

"Zero (0) hours" means that point after normal assembly line operations and adjustments are completed and before one (1) additional operating hour has been accumulated.

"Zero (0) miles" means that point after initial engine starting (not to exceed 10 miles of vehicle operation, or one hour of engine operation) at which normal assembly line operations and adjustments are completed.

§ 86.077–3 Abbreviations.

(a) The abbreviations in this section apply to this subpart and also to Subparts B, H, I, and J and have the following meanings:

accel.—acceleration.
AECD—Auxiliary emission control device.
API—American Petroleum Institute.
ASTM—American Society for Testing and Materials.
BHP—Brake horsepower.
BSCO—Brake specific carbon monoxide.
BSHC—Brake specific hydrocarbons.
$BSNO_x$—Brake specific oxides of nitrogen.
C—Celsius.
cfh—cubic feet per hour.
CFV—Critical flow venturi.
CFV–CVS—Critcal flow venturi—constant volume sampler.
CL—Chemiluminescence.
CO_2—carbon dioxide.
CO—carbon monoxide.
conc.—concentration.
cfm—cubic feet per minute.
CT—Closed throttle.
cu. in.—cubic inch(es).
CVS—Constant volume sampler.
decel.—deceleration.
EP—End point.
evap.—evaporative.
F—Fahrenheit.
FID—Flame ionozation detector.
FL—Full load.
ft.—feet.
g—gram(s).
gal.—U.S. gallon(s).
GVW—Gross vehicle weight.
GVWR—Gross vehicle weight rating.
h—hour(s).
H_2O—water.
HC—hydrocarbon(s).
HFID—Heated flame ionization detector.
Hg—mercury.
hi—high.
hp.—horsepower.
IBP—Initial boiling point.
ID—Internal diameter.
in.—inch(es).
K—kelvin.
kg—kilogram(s).
km—kilometer(s).
kPa—kilopascal(s).
lb.—pound(s).
lb.-ft.—pound-feet.
m—meter(s).
max.—maximum.
mg—milligram(s).
mi.—mile(s).
min.—minute(s).
ml—milliliter(s).
mm—millimeter(s).
mph—miles per hour.
mv—millivolt(s).
N_2—nitrogen.
NDIR—Nondispersive infrared.
NO—nitric oxide.
NO_2—nitrogen dioxide.
NO_x—oxides of nitrogen.
No.—Number.
O_2—oxygen.
Pb—lead.
pct.—percent.
PDP–CVS—Positive displacement pump–constant volume sampler.
ppm—parts per million by volume.
ppm C—parts per million, carbon.
psi—pounds per square inch.
psig—pounds per square inch gauge.
PTA—Part throttle acceleration.
PTD—Part throttle deceleration.
R—Rankin.
rpm—revolutions per minute.
RVP—Reid vapor pressure.
s—second(s).
SAE—Society of Automotive Engineers.
SI—International system of units.
sp.—speed.
TEL—Tetraethyl lead.
TML—Tetramethyl lead.
UDDS—Urban dynamometer driving schedule.
V—volt(s).
vs—versus.
W—watt(s).
WF—Weighting factor.
WOT—Wide open throttle.
wt.—weight.
'—feet.
''—inch(es).
°—degree(s).
Σ—summation.

§ 86.077–4 Section numbering; construction.

(a) *Section numbering.* The model year of initial applicability is indicated by the last two digits of the 5 digit group. A section remains in effect for subsequent model years until it is superseded. The number following the hyphen designates what previous section is replaced by a future regulation.

EXAMPLES: Section 86.077–6 applies to the 1977 and subsequent model years until superseded. If a § 86.080–6 is promulgated it would take effect with the 1980 model year; § 86.077–6 would not apply after the 1979 model year. Section 86.077–10 would be replaced by § 86.078–10 beginning with the 1978 model year.

(b) *Construction.* Except where indicated, the language in this subpart applies to both vehicles and engines. In many instances language referring to engines is enclosed in parentheses and immediately follows the language discussing vehicles.

§ 86.077–5 General standards; increase in emissions; unsafe conditions.

(a)(1) Every new motor vehicle (or new motor vehicle engine) manufactured for sale, sold, offered for sale, introduced, or delivered for introduction into commerce, or imported into the United States for sale or resale which is subject to any of the standards prescribed in this subpart shall be covered by a certificate of conformity issued pursuant to §§ 86.077–21 through 86.077–23 and §§ 86.077–29 through 86.077–34.

(2) No heavy-duty vehicle manufacturer shall take any of the actions specified in section 203(a)(1) of the Act with respect to any gasoline-fueled or Diesel heavy-duty vehicle which uses an engine which has not been certified as meeting applicable standards. Each heavy-duty vehicle manufacturer shall provide to the Administrator prior to the beginning of each model year a statement signed by an authorized representative which includes the following information:

(i) A description of the vehicles which will be produced subject to this section;

(ii) Identification of the engines used in the vehicles;

(iii) Projected sales data on each vehicle-engine combination;

(iv) A statement that the engines will not be modified by the vehicle manufacturer or a detailed specification of any changes which will be made. Changes made solely for the purpose of mounting an engine in a vehicle need not be included.

(v) A statement that the engine maintenance instruction supplied by the engine manufacturer, in compliance with § 86.077–38, will be furnished to the ultimate purchaser. If these maintenance instructions are modified, a detailed description of the modifications and a justification for each must be provided to the

Administrator for review. The Administrator will notify the manufacturer of the determination whether the modified instructions are reasonable and necessary to assure proper functioning of the emission control system.

(b)(1) Any system installed on or incorporated in a new motor vehicle (or new motor vehicle engine) to enable such vehicle (or engine) to conform to standards imposed by this subpart:

(i) Shall not in its operation or function cause the emission into the ambient air of any noxious or toxic substance that would not be emitted in the operation of such vehicle (or engine) without such system, except as specifically permitted by regulation; and

(ii) Shall not in its operation, function, or malfunction result in any unsafe condition endangering the motor vehicle, its occupants, or persons or property in close proximity to the vehicle.

(2) Every manufacturer of new motor vehicles (or new motor vehicle engines) subject to any of the standards imposed by this subpart shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicles (or motor vehicle engines) in accordance with good engineering practice to ascertain that such test vehicles (or test engines) will meet the requirements of this section for the useful life of the vehicle (or engine).

§ 86.077–6 Hearings on certification.

(a)(1) After granting a request for a hearing under §§ 86.077–22 or 86.077–30 the Administrator will designate a Presiding Officer for the hearing.

(2) The General Counsel will represent the Environmental Protection Agency in any hearing under this section.

(3) If a time and place for the hearing has not been fixed by the Administrator under §§ 86.077–22 or 86.077–30, the hearing shall be held as soon as practicable at a time and place fixed by the Administrator or by the Presiding Officer.

(4) In the case of any hearing requested pursuant to § 86.077–30(c)(5)(i), the Administrator may in his discretion direct that all argument and presentation of evidence be concluded within such fixed period not less than 30 days as he may establish from the date that the first written offer of a hearing is made to the manufacturer. To expedite proceedings, the Administrator may direct that the decision of the Presiding Officer (who may, but need not be the Administrator himself) shall be the final EPA decision.

(b)(1) Upon his appointment pursuant to paragraph (a) of this section, the Presiding Officer will establish a hearing file. The file shall consist of the notice issued by the Administrator under §§ 86.077–22 or 86.077–30 together with any accompanying material, the request for a hearing and the supporting data submitted therewith, and all documents relating to the request for certification and all documents submitted therewith, and correspondence and other data material to the hearing.

(2) The hearing file will be available for inspection by the applicant at the office of the Presiding Officer.

(c) An applicant may appear in person, or may be represented by counsel or by any other duly authorized representative.

(d)(1) The Presiding Officer upon the request of any party, or in his discretion, may arrange for a prehearing conference at a time and place specified by him to consider the following:

(i) Simplification of the issues;

(ii) Stipulations, admissions of fact, and the introduction of documents;

(iii) Limitation of the number of expert witnesses;

(iv) Possibility of agreement disposing of all or any of the issues in dispute;

(v) Such other matters as may aid in the disposition of the hearing, including such additional tests as may be agreed upon by the parties.

(2) The results of the conference shall be reduced to writing by the Presiding Officer and made part of the record.

(e)(1) Hearings shall be conducted by the Presiding Officer in an informal but orderly and expeditious manner. The parties may offer oral or written evidence, subject to the exclusion by the Presiding Officer of irrelevant, immaterial and repetitious evidence.

(2) Witnesses will not be required to testify under oath. However, the Presiding Officer shall call to the attention of witnesses that their statements may be subject to the provisions of title 18 U.S.C. 1001 which imposes penalties for knowingly making false statements or representations, or using false documents in any matter within the jurisdiction of any department or agency of the United States.

(3) Any witness may be examined or cross-examined by the Presiding Officer, the parties, or their representatives.

(4) Hearings shall be reported verbatim. Copies of transcripts of proceedings may be purchased by the applicant from the reporter.

(5) All written statements, charts, tabulations, and similar data offered in evidence at the hearing shall, upon a showing satsfactory to the Presiding Officer of their authenticity, relevancy, and materiality, be received in evidence and shall constitute a part of the record.

(6) Oral argument may be permitted in the discretion of the Presiding Officer and shall be reported as part of the record unless otherwise ordered by him.

(f)(1) The Presiding Officer shall make an initial decision which shall include written findings and conclusions and the reasons or basis therefor on all the material issues of fact, law, or discretion presented on the record. The findings, conclusions, and written decision shall be provided to the parties and made a part of the record. The initial decision shall become the decision of the Administrator without further proceedings unless there is an appeal to the Administrator or motion for review by the Administrator within 20 days of the date the initial decision was filed.

(2) On appeal from or review of the initial decision the Administrator shall have all the powers which he would have in making the initial decision including the discretion to require or allow briefs, oral argument, the taking of additional evidence or the remanding to the Presiding Officer for additional proceedings. The decision by the Administrator shall include written findings and conclusions and the reasons or basis therefor on all the material issues of fact, law, or discretion presented on the appeal or considered in the review.

§ 86.077–7 Maintenance of records; submittal of information; right of entry.

(a) The manufacturer of any new motor vehicle (or new motor vehicle engine) subject to any of the standards or procedures prescribed in this subpart shall establish, maintain and retain the following adequately organized and indexed records.

(1) *General records.* (i) The records required to be maintained by this paragraph shall consist of:

(A) Identification and description of all certification vehicles (or certification engines) for which testing is required under this subpart.

(B) A description of all emission control systems which are installed on or incorporated in each certification vehicle (or certification engine).

(C) A description of all procedures used to test each such certification vehicle (or certification engine).

(ii) A properly filed application for certification, following the format prescribed by the US EPA for the appropriate model year, fulfills each of the requirements of this paragraph (a)(1).

(2) *Individual records.* (i) A brief history of each motor vehicle (or motor vehicle engine) used for certification under this subpart in the form of a separate booklet or other document for each separate vehicle (or each separate engine) in which shall be recorded:

(A) In the case where a current production engine is modified for use in a certification vehicle (or as a certification engine), a description of the process by which the engine was selected and of the modifications made, giving specifically the place of modification and installation of the engine into the certification vehicle and the person(s) in charge of modification and installation, as applicable. In the case where the engine for a certification vehicle (or certification engine) is not derived from a current production engine, a general description of the build up of the engine (e.g., experimental heads were cast and machined according to supplied drawings, etc.) giving specifically the place of engine assembly and installation into a certification vehicle and the person(s) in charge of engine assembly and installation, as applicable. In both cases above, a description of the origin and selection process for the carburetor, distributor, fuel system components, fuel injection components, emission control system components, smoke exhaust emission control system components, and exhaust

aftertreatment devices as applicable, shall be included. The required descriptions shall specify the steps taken to assure that the certification vehicle (or certification engine) with respect to its engine, drive train, fuel system, emission control system components, exhaust aftertreatment devices, smoke exhaust emission control system components, vehicle weight or any other devices or components as applicable, that can reasonably be expected to influence exhaust or evaporative emissions, as applicable, will be representative of production vehicles (or engines) and that either all components and/or vehicle (or engine) construction processes, component inspection and selection techniques, and assembly techniques employed in constructing such vehicles (or engines) are reasonably likely to be implemented for production vehicles (or engines) or that they are as closely analogous as practicable to planned construction and assembly processes.

(B) A complete record of all emission tests performed under Subparts B, H, I, and J, as applicable (except tests performed by EPA directly), including all individual worksheets and/or other documentation relating to each such test, or exact copies thereof, the date, time, purpose, and location of each test, the number of miles accumulated on the vehicle (or the number of hours accumulated on the engine), when the tests began and ended, and the names of supervisory personnel responsible for the conduct of the tests.

(C) The date and times of each mileage (or service) accumulation run, listing both the mileage (or number of operating hours) accumulated and the name of each driver or each operator of the automatic mileage accumulation device (or dynamometer operator).

(D) If used, the record of any devices employed to record the speed and/or mileage in relationship to time of the test vehicle (or engine RPM, and/or horsepower and/or torque ir relationship to engine operating time).

(E) A record and description of all maintenance and other servicing performed, giving the date and time of the maintenance or service, the reason for it, the person authorizing it, and the names of supervisory personnel responsible for the conduct of the maintenance or service. The description shall indicate whether or not EPA specifically consented to the work and, if EPA did not, shall list the provision of this part which authorizes its performance.

(F) A record and description of each test performed to diagnose engine or emissions control system performance, giving the date and time of the tests, the reason for it, the person authorizing it, and the names of supervisory personnel responsible for the conduct of the test.

(G) The dates and times that the vehicle (or engine) was idle in storage, and in transit or transport.

(H) A brief description of any significant events affecting the vehicle (or engine) during any time in the period covered by the history not described by an entry under one of the previous headings including such extraordinary events as vehicle accidents (or accidents involving the engine) or driver speeding citations or warnings (or dynamometer runaway).

(ii) Each such history shall be started on the date that the first of any of the selection or buildup activities in paragraph (a)(2)(i)(A) of this section occurred with respect to the certification vehicle (or engine), shall be updated each time the operational status of the vehicle (or engine) changes or additional work is done on it, and shall be kept in a designated location.

(3) All records required to be maintained under this subpart shall be retained by the manufacturer for a period of six (6) years after issuance of all certificates of conformity to which they relate. Records may be retained as hard copy or reduced to microfilm, punch cards, etc., depending on the record retention procedures of the manufacturer, *Provided*, That in every case all the information contained in the hard copy shall be retained.

(b) The manufacturer of any new motor vehicle (or new motor vehicle engine) subject to any of the standards prescribed in this subpart shall submit to the Administrator at the time of issuance by the manufacturer copies of all instructions or explanations regarding the use, repair, adjustment, maintenance, or testing of such vehicle (or engine) relevant to the control of crankcase, exhaust or evaporative emissions, as applicable, issued by the manufacturer for use by other manufacturers, assembly plants, distributors, dealers, and ultimate purchasers; *Provided*, That any material not translated into the English language need not be submitted unless specifically requested by the Administrator.

(c)(1) Any manufacturer who has applied for certification of a new motor vehicle (or new motor vehicle engine) subject to certification test under this subpart shall admit or cause to be admitted any EPA Enforcement Officer during operating hours on presentation of credentials to any of the following:

(i) Any facility where any such tests or any procedures or activities connected with such tests are or were performed.

(ii) Any facility where any new motor vehicle (or new motor vehicle engine) which is being, was, or is to be tested is present.

(iii) Any facility where any construction process or assembly process used in the modification or build up of such a vehicle (or engine) into a certification vehicle (or certification engine) is taking place or has taken place.

(iv) Any facility where any record or other document relating to any of the above is located.

(2) Upon admission to any facility referred to in paragraph (c)(1) of this section, any EPA Enforcement Officer shall be allowed:

(i) To inspect and monitor any part or aspect of such procedures, activities, and testing facilities, including, but not limited to, monitoring vehicle (or engine) preconditioning, emissions tests and mileage (or service) accumulation, maintenance, and vehicle soak and storage procedures (or engine storage procedures), and to verify correlation or calibration of test equipment;

(ii) To inspect and make copies of any such records, designs, or other documents; and

(iii) To inspect and/or photograph any part or aspect of any such certification vehicle (or certification engine) and any components to be used in the construction thereof.

(3) In order to allow the Administrator to determine whether or not production motor vehicles (or production motor vehicle engines) conform in all material respects to the design specifications which applied to those vehicles (or engines) described in the application for certification for which a certificate of conformity has been issued to standards prescribed under section 202 of the Act, any manufacturer shall admit any EPA Enforcement Officer on presentation of credentials to both:

(i) Any facility where any document, design, or procedure relating to the translation of the design and construction of engines and emission related components described in the application for certification or used for certification testing into production vehicles (or production engines) is located or carried on; and

(ii) Any facility where any motor vehicles (or motor vehicle engines) to be introduced into commerce are manufactured or assembled.

(4) On admission to any such facility referred to in paragraph (c)(3) of this section, any EPA Enforcement Officer shall be allowed:

(i) To inspect and monitor any aspects of such manufacture or assembly and other procedures;

(ii) To inspect and make copies of any such records, documents or designs; and

(iii) To inspect and photograph any part or aspect of any such new motor vehicles (or new motor vehicle engines) and any component used in the assembly thereof that are reasonably related to the purpose of his entry.

(5) Any EPA Enforcement Officer shall be furnished by those in charge of a facility being inspected with such reasonable assistance as he may request to help him discharge any function listed in this paragraph. Each applicant for or recipient of certification is required to cause those in charge of a facility operated for its benefit to furnish such reasonable assistance without charge to EPA whether or not the applicant controls the facility.

(6) The duty to admit or cause to be admitted any EPA Enforcement Officer applies whether or not the applicant owns or controls the facility in question and applies both to domestic and to foreign manufacturers and facilities. EPA will not attempt to make any inspections which it has been informed that local law forbids. However, if local law makes it impossible to do what is necessary to insure the accuracy of data generated at a facility, no informed judgment that a

vehicle or engine is certifiable or is covered by a certificate can properly be based on those data. It is the responsibility of the manufacturer to locate its testing and manufacturing facilities in jurisdictions where this situation will not arise.

(7) For purposes of this paragraph:

(i) "Presentation of credentials" shall mean display of the document designating a person as an EPA Enforcement Officer.

(ii) Where vehicle, component, or engine storage areas or facilities are concerned, "operating hours" shall mean all times during which personnel other than custodial personnel are at work in the vicinity of the area or facility and have access to it.

(iii) Where facilities or areas other than those covered by paragraph (c)(7)(ii) of this section are concerned, "operating hours" shall mean all times during which an assembly line is in operation or all times during which testing, maintenance, mileage (or service) accumulation, production or compilation of records, or any other procedure or activity related to certification testing, to translation of designs from the test stage to the production stage, or to vehicle (or engine) manufacture or assembly is being carried out in a facility.

(iv) "Reasonable assistance" includes, but is not limited to, clerical, copying, interpretation and translation services, the making available on request of personnel of the facility being inspected during their working hours to inform the EPA Enforcement Officer of how the facility operates and to answer his questions, and the performance on request of emissions tests on any vehicle (or engine) which is being, has been, or will be used for certification testing. Such tests shall be nondestructive, but may require appropriate mileage (or service) accumulation. A manufacturer may be compelled to cause the personal appearance of any employee at such a facility before an EPA Enforcement Officer by written request for his appearance, signed by the Assistant Administrator for Enforcement, served on the manufacturer. Any such employee who has been instructed by the manufacturer to appear will be entitled to be accompanied, represented, and advised by counsel.

(v) Any entry without 24 hour prior written or oral notification to the affected manufacturer shall be authorized in writing by the Assistant Administrator for Enforcement.

§ 86.077–8 Emission standards for 1977 light-duty vehicles.

(a)(1) Exhaust emissions from 1977 model year light duty vehicles shall not exceed:

(i) *Hydrocarbons.* 0.41 grams per vehicle mile.

(ii) *Carbon monoxide.* 3.4 grams per vehicle mile.

(iii) *Oxides of nitrogen.* 2.0 grams per vehicle mile.

(2) For those manufacturers who have been granted a suspension of the standards specified in paragraph (a)(1) the following standards for exhaust emissions from 1977 model year light-duty vehicles shall apply:

(i) *Hydrocarbons.* 1.5 grams per vehicle mile.

(ii) *Carbon monoxide.* 15 grams per vehicle mile.

(iii) *Oxides of nitrogen.* 2.0 grams per vehicle mile.

(3) The standards set forth in paragraphs (a)(1) and (a)(2) of this section refer to the exhaust emitted over a driving schedule as set forth in Subpart B and measured and calculated in accordance with those procedures.

(b)(1) Fuel evaporative emissions from 1977 model year gasoline-fueled light-duty vehicles shall not exceed:

(i) *Hydrocarbons.* 2.0 grams per test.

(2) The standard set forth in paragraph (a)(1) of this section refers to a composite sample of the fuel evaporative emissions collected under the conditions set forth in Subpart B and measured in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any 1977 model year gasoline-fueled light-duty vehicle.

§ 86.077–9 Emission standards for 1977 light-duty trucks.

(a)(1) Exhaust emissions from 1977 and later model year light-duty trucks shall not exceed:

(i) *Hydrocarbons.* 2.0 grams per vehicle mile.

(ii) *Carbon monoxide.* 20 grams per vehicle mile.

(iii) *Oxides of nitrogen.* 3.1 grams per vehicle mile.

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over a driving schedule as set forth in Subpart B and measured and calculated in accordance with those procedures.

(b)(1) Fuel evaporative emissions from 1977 model year gasoline-fueled light-duty trucks shall not exceed:

(i) *Hydrocarbons.* 2.0 grams per test.

(2) The standard set forth in paragraph (b)(1) of this section refers to a composite sample of the fuel evaporative emissions collected under the conditions set forth in Subpart B and measured in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any 1977 model year gasoline-fueled light-duty truck.

§ 86.077–10 Emission standards for 1977 gasoline-fueled heavy-duty engines.

(a)(1) Exhaust emissions from new 1977 and later model year gasoline-fueled heavy-duty engines shall not exceed:

(i) *Hydrocarbons plus oxides of nitrogen (as NO_2).* 16 grams per brake horsepower hour.

(ii) *Carbon monoxide.* 40 grams per brake horsepower hour.

(2) The standards set forth in paragraph (b)(1) of this section refer to composite samples representing the operating cycle set forth in Subpart H and measured in accordance with those procedures.

(b) [Reserved]

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any new 1977 and later model year gasoline-fueled heavy-duty engine.

(d) Every manufacturer of new motor vehicle engines subject to the standards prescribed in this subpart shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in accordance with test procedures prescribed in Subpart H to ascertain that such test engines meet the requirements of paragraphs (a) and (c) of this section.

§ 86.077–11 Emission standards for 1977 Diesel heavy-duty engines.

(a)(1) The opacity of smoke emissions from new 1977 and later model year Diesel heavy-duty engines shall not exceed:

(i) 20 percent during the engine acceleration mode.

(ii) 15 percent during the engine lugging mode.

(iii) 50 percent during the peaks in either mode.

(2) The standards set forth in paragraph (a)(1) of this section refer to exhaust smoke emissions generated under the conditions set forth in Subpart I and measured and calculated in accordance with those procedures.

(b)(1) Exhaust gaseous emissions from new 1977 and later model year Diesel heavy-duty engines shall not exceed:

(i) *Hydrocarbons plus oxides of nitrogen (as NO_2).* 16 grams per brake horsepower hour.

(ii) *Carbon monoxide.* 40 grams per brake horsepower hour.

(2) The standards set forth in paragraph (b)(1) of this section refer to exhaust gaseous emissions generated under the conditions set forth in Subpart J and measured and calculated in accordance with those procedures.

(c)–(d) [Reserved]

(e) Every manufacturer of new motor vehicle engines subject to the standards prescribed in this subpart shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in accordance with test procedures prescribed in Subparts I and J to ascertain that such test engines meet the requirements of paragraphs (a) and (b) of this section.

§ 86.077–12—§ 86.077–20 [Reserved]

§ 86.077–21 Application for certification.

(a) A separate application for a certificate of conformity shall be made for each set of standards and each class of new motor vehicles or new motor vehicle engines. Such application shall be made to the Administrator by the manufacturer and shall be updated and corrected by amendment.

(b) The application shall be in writing, signed by an authorized representative of the manufacturer, and shall include the following:

(1) Identification and description of the vehicles (or engines) covered by the application and a description of their engine (vehicles only), emission control

system, and fuel system components. This shall include a detailed description of each auxiliary emission control device (AECD) to be installed in or on any certification test vehicle (or certification test engine).

(2) Projected U.S. sales data sufficient to enable the Administrator to select a test fleet representative of the vehicles (or engines) for which certification is requested.

(3) A description of the test equipment and fuel proposed to be used.

(4) A description of the proposed mileage (or service) accumulation procedure for durability testing.

(5) A statement of recommended maintenance and procedures necessary to assure that the vehicles (or engines) covered by a certificate of conformity in operation conform to the regulations, and a description of the program for training of personnel for such maintenance, and the equipment required.

(6) At the option of the manufacturer, the proposed composition of the emission data and durability data test fleet.

(c) Complete copies of the application and of any amendments thereto, and all notifications under §§ 86.077–32, 86.077–33, and 86.077–34 shall be submitted in such multiple copies as the Administrator may require.

§ 86.077–22 Approval of application for certification; test fleet selections.

(a) After a review of the application for certification and any other information which the Administrator may require, the Administrator may approve the application and select a test fleet in accordance with § 86.077–24.

(b) The Administrator may disapprove in whole or in part an application for certification for reasons including incompleteness, inaccuracy, inappropriate proposed mileage (or service) accumulation procedures, test equipment, or fuel, and incorporation of defeat devices in vehicles (or on engines) described by the application.

(c) Where any part of an application is rejected, the Administrator shall notify the manufacturer in writing and set forth the reasons for such rejection. Within 30 days following receipt of such notification, the manufacturer may request a hearing on the Administrator's determination. The request shall be in writing, signed by an authorized representative of the manufacturer and shall include a statement specifying the manufacturer's objections to the Administrator's determinations, and data in support of such objections. If, after the review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 86.077–6 with respect to such issue.

§ 86.077–23 Required data.

(a) The manufacturer shall perform the tests required by the applicable test procedures, and submit to the Administrator the following information: *Provided, however,* That: (1) If requested by the manufacturer, the Administrator may waive any requirement of this section for testing of vehicles (or engines) for which emission data are available, or will be made available, under the provisions of § 86.077–29, or

(2) If requested by the manufacturer, the Administrator may waive any requirement of this section for testing of vehicles (or engines) at zero kilometers (or zero hours) of operation.

(b) Durability data on such vehicles (or engines) tested in accordance with the applicable test procedures and in such numbers as specified, which will show the performance of the systems installed on or incorporated in the vehicle (or engine) for extended mileage (or extended operation), as well as a record of all pertinent maintenance (all maintenance and servicing for Diesel heavy-duty engines) performed on the test vehicles (or test engines).

(c) *Emission data.* (1) *Certification vehicles.* (i) Emission data on such vehicles tested in accordance with applicable test procedures and in such numbers as specified, which will show their emissions after zero kilometers (zero miles) and 6436 kilometers (4000 miles) of operation.

(ii) Emission data on those vehicles selected under § 86.077–24(b)(1)(v) and tested in accordance with the applicable test procedures of this part and in such numbers as therein specified, which shall be tested at zero kilometers (zero miles) at any altitude, and under high-altitude conditions after 6436 kilometers (4000 miles) of operation at any altitude.

(2) *Certification engines.* Emission data on such engines tested in accordance with applicable emission test procedures and in such numbers as specified, which will show their emissions after zero hours and 125 hours of operation.

(d) A statement that the vehicles (or engines) for which certification is requested conform to the requirements in § 86.077–5(b) and that the descriptions of tests performed to ascertain compliance with the general standards in § 86.077–5(b) and the data derived from such tests are available to the Administrator upon request.

(e) A statement that the test vehicles (or test engines) with respect to which data are submitted to demonstrate compliance with §§ 86.077–8, 86.077–9, 86.077–10, or § 86.077–11, as applicable, are in all material respects as described in the manufacturer's application for certification, have been tested in accordance with the applicable test procedures utilizing the fuels and equipment described in the application for certification, and that on the basis of such tests the vehicles (or engines) conform to the requirements of the regulations in this part. If such statements cannot be made with respect to any vehicle (or engine) tested, the vehicle (or engine) shall be identified, and all pertinent data relating thereto shall be supplied to the Administrator. If, on the basis of the data supplied and any additional data as required by the Administrator, the Administrator determines that the test vehicle (or test engine) was not as described in the application for certification or was not tested in accordance with applicable test procedures utilizing the fuels and equipment as described in the application for certification, the Administrator may make the determination that the vehicle (or engine) does not meet the applicable standards. The provisions of § 86.077–30 (b) shall then be followed.

§ 86.077–24 Test vehicles and engines.

(a)(1) The vehicles or engines covered by an application for certification will be divided into groupings of engines which are expected to have similar emission characteristics throughout their useful life. Each group of engines with similar emission characteristics shall be defined as a separate engine family.

(2) To be classed in the same engine family, engines must be identical in all the following respects:

(i) The cylinder bore center-to-center dimensions.

(ii) The dimension from the centerline of the crankshaft to the centerline of the camshaft.

(iii) The dimension from the centerline of the crankshaft to the top of the cylinder block head face.

(iv) The cylinder block configuration (air cooled or water cooled; L–6, 90° V–8, etc.).

(v) The location of intake and exhaust valves and the valve sizes (within a ⅛-inch range on the valve head diameter).

(vi) The method of air aspiration.

(vii) The combustion cycle.

(viii) Catalytic converter characteristics; gasoline-fueled vehicles and engines only.

(ix) Thermal reactor characteristics; gasoline-fueled vehicles and engines only.

(3) Engines identical in all the respects listed in paragraph (a)(2) of this section may be further divided into different engine families if the Administrator determines that they may be expected to have different emission characteristics. This determination will be based upon a consideration of the following features of each engine.

(i) The bore and stroke.

(ii) The surface-to-volume ratio of the nominally dimensioned cylinder at the top dead center position.

(iii) The intake manifold induction port size and configuration.

(iv) The exhaust manifold port size and configuration.

(v) The intake and exhaust valve sizes.

(vi) The fuel system.

(vii) The camshaft timing and ignition or injection timing characteristics.

(4) Where engines are of a type which cannot be divided into engine families based upon the criteria listed in paragraphs (a) (2) and (3) of this section, the Administrator will establish families for those engines based upon the features most related to their emission characteristics.

(b) Emission data. (1) *Emission-data vehicles.* Paragraph (b)(1) of this section applies to light-duty vehicle and light-duty truck emission-data vehicles.

(i) Vehicles will be chosen to be operated and tested for emission data based upon the engine family groupings. Within each engine family, the requirements of this paragraph must be met.

(ii) Vehicles of each engine family will be divided into engine displacement-exhaust emission control system-evaporative emission control system combinations as applicable. A projected sales volume will be established for each combination for the model year for which certification is sought. One vehicle of each combination will be selected in order of decreasing projected sales volume until 70 percent of the projected sales of a manufacturer's total production of vehicles of that engine family is represented, or until a maximum of four vehicles is selected. If any single combination represents over 70 percent, then two vehicles of that combination may be selected. The vehicle selected for each combination will be specified by the Administrator as to such features as transmission type, fuel system, and inertia weight class.

(iii) The Administrator may select a maximum of four additional vehicles within each engine family based upon features indicating that they may have the highest emission levels of the vehicles in that engine family. In selecting these vehicles, the Administrator will consider such features as the emission control system combination, induction system characteristics, ignition system characteristics, fuel system, rated horsepower, rated torque, compression ratio, inertia weight class, transmission options, and axle ratios.

(iv) If the vehicles selected in accordance with paragraphs (b)(1) (ii) and (iii) of this section do not represent each engine-system combination, then one vehicle of each engine-system combination not represented will be selected by the Administrator. The vehicle selected shall be of the engine displacement with the largest projected sales volume of vehicles with the control system combination in the engine family and will be designated by the Administrator as to such features as transmission type, fuel system, and inertia weight class.

(v) The Administrator will also select one vehicle for each engine-system combination within an engine family for which vehicles are to be sold to ultimate purchasers at high altitude.

(vi) The Administrator may combine testing requirements for any vehicle selected under paragraph (b)(1)(v) of this section with the testing requirements for any similar vehicle in the same engine-system combination selected under paragraphs (b)(1) (ii), (iii), or (iv) of this section by requiring a vehicle selected for testing under paragraphs (b)(1) (ii), (iii), or (iv) of this section to be modified (if necessary) after mileage accumulation and emission testing for the purpose of demonstrating compliance in accordance with § 86.077-23(c)(1)(ii).

(2) *Gasoline-fueled heavy-duty emission-data engines.* Paragraph (b)(2) of this section applies to gasoline-fueled heavy-duty emission-data engines.

(i) Engines will be chosen to be run for emission data based upon the engine family groupings. Within each engine family, the requirements of this paragraph must be met.

(ii) Engines of each engine family will be divided into engine displacement-exhaust emission control system combinations. A projected sales volume will be established for each combination for the applicable model year. One engine of each combination will be selected in order of decreasing projected sales volume until 70 percent of the projected sales of a manufacturer's total production of engines of that family is represented, or until a maximum of four engines is selected. The engines selected for each combination will be specified by the Administrator as to fuel system.

(iii) The Administrator may select a maximum of two additional engines within each engine family based upon features indicating that they may have the highest emission levels of the engines in that engine family. In selecting these engines, the Administrator will consider such features as the exhaust emission control system, induction system characteristics, ignition system characteristics, fuel system, rated horsepower, rated torque, and compression ratio.

(iv) If the engines selected in accordance with paragraphs (b)(2) (ii) and (iii) of this section do not represent each engine displacement-exhaust emission control system combination, then one engine of each engine displacement-exhaust emission control system combination not represented shall be selected by the Administrator.

(3) *Diesel heavy-duty emission-data engines.* Paragraph (b)(3) of this section applies to Diesel heavy-duty emission-data engines.

(i) Engines will be chosen to be run for emission data based upon engine family groupings. Within each engine family, the requirements of this paragraph must be met.

(ii) Engines of each engine family will be divided into groups based upon their exhaust emission control systems. One engine of each engine-system combination shall be run for smoke emission data and gaseous emission data as prescribed in § 86.077-26(c)(3). Either the complete gaseous emission test or the complete smoke test may be conducted first. Within each combination, the engine that features the highest fuel feed per stroke, primarily at the speed of maximum rated torque and secondarily at rated speed, will usually be selected. If there are military engines with higher fuel rates than other engines in the same engine-system combination, then one military engine shall be also selected. The engine with the highest fuel feed per stroke will usually be selected.

(iii) The Administrator may select a maximum of one additional engine within each engine-system combination based upon features indicating that it may have the highest emission levels of the engines of that combination. In selecting this engine, the Administrator will consider such features as the injection system, fuel system, compression ratio, rated speed, rated horsepower, peak torque speed, and peak torque.

(c) Durability data. (1) *Durability-data vehicles.* Paragraph (c)(1) of this section applies to light-duty vehicle and light-duty truck durability-data vehicles.

(i) A durability-data vehicle will be selected by the Administrator to represent each engine-system combination. The vehicle selected shall be of the engine displacement with the largest projected sales volume of vehicles with that control-system combination in that engine family and will be designated by the Administrator as to transmission type, fuel system, and inertia weight class.

(ii) A manufacturer may elect to operate and test additional vehicles to represent any engine-system combination. The additional vehicles must be of the same engine displacement, transmission type, fuel system, and inertia weight class as the vehicle selected for that engine-system combination in accordance with the provisions of paragraph (c)(1)(i) of this section. Notice of an intent to operate and test additional vehicles shall be given to the Administrator not later than 30 days following notification of the test fleet selection.

(2) *Gasoline-fueled heavy-duty durability-data engines.* Paragraph (c)(2) of this section applies to gasoline-fueled heavy-duty durability-data engines.

(i) A durability-data engine will be selected by the Administrator to represent each engine-system combination. The engine selected shall be of the displacement with the largest projected sales volume of engines with that exhaust emission control system in that engine family and will be designated by the Administrator as to fuel system.

(ii) [Reserved]

(iii) A manufacturer may elect to operate and test additional engines to represent any engine-system combination. The additional engines must be of the same engine displacement and fuel system as the engine selected for that combination in accordance with the provisions of paragraph (c)(2)(i) of this section. Notice of an intent to run additional engines shall be given to the Administrator not later than 30 days following notification of the test fleet selection. Deterioration factors calculated for each engine-system combination shall be applied separately to military and nonmilitary engines within the same engine-system combination.

(3) *Diesel heavy-duty durability-data engines.* Paragraph (c)(3) of this section applies to Diesel heavy-duty durability-data engines.

(i) One engine from each engine-system combination shall be tested as prescribed in § 86.077-26(c)(3)(ii). At each test point, either the complete gaseous emission test or the complete smoke test may be conducted first. Within each combination, the engine

which features the highest fuel feed per stroke, primarily at rated speed and secondarily at the speed of maximum rated torque, will usually be selected for durability testing. In the case where more than one engine in an engine-system combination has the highest fuel feed per stroke, the engine with the highest maximum rated horsepower will usually be selected for durability testing. If an engine-system combination includes both military and nonmilitary engines, then the nonmilitary engine with the highest maximum rated horsepower will usually be selected for durability testing.

(ii) A manufacturer may elect to operate and test additional engines to represent any engine-system combination. The additional engines must be of the same model and fuel system as the engine selected in accordance with the provisions of paragraph (c) (3) (i) of this section. Notice of an intent to test additional engines shall be given to the Administrator not later than 30 days following notification of the test fleet selection. Deterioration factors calculated for each engine-system combination shall be applied separately to military and nonmilitary engines within the same engine-system combination.

(d) For purposes of testing under § 86.077–26(a) (9), (b) (9) or (c) (11), the Administrator may require additional emission-data vehicles (or emission-data engines) and durability-data vehicles (or durability-data engines) identical in all material respects to vehicles (or engines) selected in accordance with paragraphs (b) and (c) of this section: *Provided*, That the number of vehicles (or engines) selected shall not increase the size of either the emission-data fleet or the durability-data fleet by more than 20 percent or one vehicle (or engine) whichever is greater.

(e) Any manufacturer whose projected sales for the model year in which certification is sought is less than

(1) 2000 gasoline-fueled light-duty vehicles, or

(2) 2000 Diesel light-duty vehicles, or

(3) 2000 gasoline-fueled light-duty trucks, or

(4) 2000 Diesel light-duty trucks, or

(5) 700 gasoline-fueled heavy-duty engines, or

(6) 200 Diesel heavy-duty engines, may request a reduction in the number of test vehicles (or engines) determined in accordance with the foregoing provisions of this section. The Administrator may agree to such lesser number as he determines would meet the objectives of this procedure.

(f) In lieu of testing an emission-data or durability-data vehicle (or engine) selected under paragraph (b) or (c) of this section, and submitting data therefore, a manufacturer may, with the prior written approval of the Administrator, submit exhaust emission data and/or fuel evaporative emission data, as applicable on a similar vehicle (or engine) for which certification has previously been obtained or for which all applicable data required under § 86.077–23 has previously been submitted.

(g) (1) This paragraph applies to light-duty vehicles and light-duty trucks.

(2) Where it is expected that more than 33 percent of an engine family will be equipped with an optional item, the full estimated weight of that item shall be included, unless excluded by the Administrator, in the curb weight computation for each vehicle available with that option in the engine family. Where it is expected that 33 percent or less of the vehicles in an engine family will be equipped with an item of optional equipment, no weight for that item will be added in computing curb weight. In the case of mutually exclusive options, only the weight of the heavier option will be added in computing curb weight. Optional equipment weighing less than 3 pounds per item need not be considered.

(3) Where it is expected that more than 33 percent of an engine family will be equipped with an item of optional equipment that can reasonably be expected to influence emissions, then such items of optional equipment shall actually be installed, unless specifically excluded by the Administrator, on all emission-data and durability-data vehicles in the engine family on which the option is intended to be offered in production. Optional equipment that can reasonably be expected to influence emissions are the air conditioner, power steering, power brakes, and other items determined by the Administrator.

(4) Optional equipment that can reasonably be expected to influence emissions which is utilized on 33 percent or less of the vehicles in the engine family shall not be installed on any vehicle in that engine family unless specifically required under this section.

§ 86.077–25 Maintenance.

(a) *Light-duty vehicles and light-duty trucks.* Paragraph (a) of this section applies to light-duty vehicles and light-duty trucks.

(1) Scheduled maintenance on the engine, emission control system and fuel system of durability-data vehicles shall be scheduled for performance during durability testing at the same mileage intervals that will be specified in the manufacturer's maintenance instructions furnished to the ultimate purchaser of the motor vehicle. Such maintenance shall be performed, except as provided in paragraph (a) (5) (iii) of this section, only under the following provisions:

(i) Scheduled major engine tuneups to manufacturer's specifications may be performed no more frequently than every 12,500 miles of scheduled driving, provided that no tuneup may be performed after 45,000 miles of scheduled driving. A scheduled major engine tuneup shall be restricted to paragraph (a) (1) (i) (A) or (B) of this section, as applicable, and shall be conducted in a manner consistent with service instructions and specifications provided by the manufacturer for use by customer service personnel.

(A) *For gasoline-fueled vehicles*, the following items may be inspected, replaced, cleaned, adjusted, and/or serviced as required:

(*1*) Ignition system.

(*2*) Cold starting enrichment system (includes fast idle speed setting).

(*3*) Curb idle speed and air/fuel mixture.

(*4*) Drive belt tension on engine accessories.

(*5*) Valve lash.

(*6*) Inlet air and exhaust gas control valves.

(*7*) Engine bolt torque.

(*8*) Spark plugs.

(*9*) Fuel filter and air filter.

(*10*) Crankcase emission control system.

(*11*) Fuel evaporative emission control system.

(B) *For Diesel vehicles*, a major engine tuneup shall be restricted to the following:

(*1*) Adjust low idle speed.

(*2*) Adjust valve lash if required.

(*3*) Adjust injector timing.

(*4*) Adjust governor.

(*5*) Clean and service injector tips.

(*6*) Adjust drive belt tension on engine accessories.

(*7*) Check engine bolt torque and tighten as required.

(ii) Change of engine and transmission oil, and change or service of oil filter will be allowed at the same mileage intervals that will be specified in the manufacturer's maintenance instructions.

(iii) Readjustment of the engine idle speed (curb idle and fast idle) may be performed, in addition to adjustment during scheduled major engine tuneups, once during the first 5,000 miles of vehicle operation.

(2) (i) *For gasoline-fueled vehicles*, unscheduled maintenance on the engine, emission control system and fuel system of durability-data vehicles may be performed, except as provided in paragraph (a) (5) (i) of this section, only under the following provisions:

(A) Any persistently misfiring spark plug may be replaced, in addition to replacement at scheduled major engine tuneup points.

(B) Readjustment of the engine cold starting enrichment system may be performed if there is a problem of stalling or if there is visible black smoke.

(C) Readjustment of the engine idle speed (curb idle and fast idle) may be performed, in addition to that performed as scheduled maintenance under paragraph (a) (1) of this section, if the idle speed exceeds the manufacturer's recommended idle speed by 300 r.p.m. or more, or if there is a problem of stalling.

(D) The idle mixture may be reset, other than during scheduled major engine tuneups, only with the advance approval of the Administrator.

(ii) *For Diesel vehicles*, unscheduled maintenance on the engine, emission control system and fuel system of durability-data vehicles may be performed, except as provided in paragraph (a) (5) (i) of this section, only under the following provisions:

(A) Injectors may be changed if a persistent misfire is detected.

(B) Readjustment of the engine idle speed (curb idle and fast idle) may be performed, in addition to that performed as scheduled maintenance under paragraph (a)(1) of this section, if the idle speed exceeds the manufacturer's recommended idle speed by 300 r.p.m. or more, or if there is a problem of stalling.

(3) An exhaust gas recirculation (EGR) system may be serviced during durability testing only under one of the following provisions:

(i) Manufacturers may schedule service to the EGR system at the scheduled major engine tuneups if an audible and/or visual signal approved by the Administrator alerts the vehicle operator to the need for EGR system maintenance at each of these mileage points. One additional servicing may also be performed as unscheduled maintenance if there is an overt indication of malfunction and if the malfunction or repair of the malfunction does not render the test vehicle unrepresentative of vehicles in use.

(ii) Manufacturers may service the EGR system as unscheduled maintenance a maximum of three times during the 50,000 miles if failure of the EGR system activates an audible and/or visual signal approved by the Administrator which alerts the vehicle operator to the need for EGR system maintenance. One additional servicing may also be performed as unscheduled maintenance if there is an overt indication of malfunction and if the malfunction or repair of the malfunction does not render the test vehicle unrepresentative of vehicles in use.

(iii) Manufacturers may service the EGR system a maximum of three times during the 50,000 miles either at a scheduled major engine tuneup point or as unscheduled maintenance, if an audible and/or visual signal approved by the Administrator alerts the vehicle operator to the need for EGR system maintenance. The signal may be activated either by EGR system failure (unscheduled maintenance) or need for scheduled periodic maintenance. If maintenance is performed, the signal for scheduled periodic maintenance shall be reset. One additional servicing may also be performed as unscheduled maintenance if there is an overt indication of malfunction and if the malfunction or repair of the malfunction does not render the test vehicle unrepresentative of the vehicles in use.

(iv) Manufacturers may schedule service to the EGR system at the scheduled major engine tuneup(s) if failure to perform EGR system maintenance is not likely, as determined by the Administrator, to result in an improvement in vehicle performance. One additional servicing may also be performed as unscheduled maintenance if there is an overt indication of malfunction and if the malfunction or repair of the malfunction does not render the test vehicle unrepresentative of vehicles in use.

(4) The catalytic converter may be serviced once during 50,000 miles if an audible and/or visual signal approved by the Administrator alerts the vehicle operator to the need for maintenance. The signal may be activated either by component failure or need for maintenance at a scheduled point.

(5) Any other engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement on durability-data vehicles shall be performed only with the advance approval of the Administrator.

(i) In the case of unscheduled maintenance, such approval will be given if the Administrator:

(A) Has made a preliminary determination that part failure or system malfunction, or the repair of such failure or malfunction, does not render the vehicle unrepresentative of vehicles in use, and does not require direct access to the combustion chamber, except for spark plug, fuel injection component, or removable prechamber removal or replacement (as applicable); and

(B) Has made a determination that the need for maintenance or repairs is indicated by an overt indication of malfunction such as persistent misfiring, vehicle stalling, overheating, fluid leakage, loss of oil pressure, or charge indicator warning.

(ii) Emission measurements may not be used as a means of determining the need for unscheduled maintenance under paragraph (a)(5)(i)(A).

(iii) Requests for authorization of scheduled maintenance of emission control-related components not specifically authorized to be maintained by these regulations must be made prior to the beginning of durability testing. The Administrator will approve the performance of such maintenance if the manufacturer makes a satisfactory showing that the maintenance will be performed on vehicles in use.

(6) If the Administrator determines that part failure or system malfunction occurrence and/or repair rendered the vehicle unrepresentative of vehicles in use, the vehicle shall not be used as a durability-data vehicle.

(7) Where the Administrator agrees under § 86.077–26 to a mileage accumulation of less than 50,000 miles for durability testing, he may modify the requirements of this paragraph.

(8)(i) Adjustment of engine idle speed on emission-data vehicles may be performed once before the 6436-kilometer (4000-mile) test point. Any other engine, emission control system or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement on emission-data vehicles shall be performed only with the advance approval of the Administrator.

(ii) Maintenance on emission-data vehicles selected under § 86.077–24(b)(1)(v) and permitted to be tested for purposes of § 86.077–23(b)(1)(ii) under the provisions of § 86.077–24(b)(1)(vi) may be performed in conjunction with emission control system modifications at the 6436-kilometer (4000-mile) test point, and shall be performed in accordance with the maintenance instructions to be provided to the ultimate purchaser required under § 86.077–33.

(iii) Maintenance on those emission-data vehicles selected under § 86.077–24(b)(1)(v) which are not capable of being modified in the field for the purpose of complying with emission standards at an altitude other than intended by the original design may be performed in conjunction with the emission control system modifications at the 6436-kilometer (4000-mile) test point, and shall be approved in advance by the Administrator.

(9) Repairs to vehicle components of the durability-data or emission-data vehicle other than the engine, emission control system, or fuel system, shall be performed only as a result of part failure, vehicle system malfunction, or with the advance approval of the Administrator.

(10) Complete emission tests (see §§ 86.177–5 through 86.177–23) are required, unless waived by the Administrator, before and after any vehicle maintenance which may reasonably be expected to affect emissions. These test data shall be air posted to the Administrator within 24 hours (or delivered within 3 working days) after the test along with a complete record of all pertinent maintenance including a preliminary engineering report of any malfunction diagnosis and corrective action taken. A complete engineering report shall be delivered or air posted to the Administrator within 10 working days after the tests. In addition, all test data and maintenance reports shall be compiled and provided to the Administrator in accordance with § 86.077–23.

(11) The Administrator shall be given the opportunity to verify the existence of an overt indication of part failure and/or vehicle malfunction (e.g., misfiring, stalling, black smoke), or an activation of an audible and/or visual signal, prior to the performance of any maintenance to which such overt indication or signal is relevant under the provisions of this section.

(12) Equipment, instruments, or tools may not be used to identify malfunctioning, maladjusted, or defective engine components unless the same or equivalent equipment, instruments, or tools will be available to dealerships and other service outlets and

(i) Are used in conjunction with scheduled maintenance on such components.

(ii) Are used subsequent to the identification of a vehicle or engine malfunction, as provided in paragraph (a)(5)(i) of this section for durability-data vehicles or paragrap (a)(8)(i) of this section for paragraph (a)(8)(i) of this section for emission-data vehicles, or

(iii) Unless specifically authorized by the Administrator.

(b) [Reserved]

(c)(1) *Gasoline-fueled heavy-duty engines.* Paragraph (c) of this section applies to gasoline-fueled heavy-duty engines.

(2)(i) Scheduled maintenance may be performed on durability-data engines only under the following provisions:

(A) Major engine tuneups to manufacturer's specifications may be performed no more frequently than every 375 hours of scheduled dynamometer operation, provided no tuneups are performed after 1375 hours of scheduled dynamometer operation. The maintenance to be performed on the durability-data engines shall be requested in the application for certification and shall be specified at the same intervals in the maintenance instructions which will be furnished to the ultimate purchaser of the vehicle in which the engine, which is represented by the test engine, is installed. (For equivalent dynamometer hours, engine hours, and mileage intervals, see § 86.077–2.) A scheduled major engine tuneup shall be restricted to paragraphs (c)(2)(i)(A)(*1*) through (*12*) of this section and shall be conducted in a manner consistent with service instructions and specifications provided by the manufacturer for use by the customer service personnel. The following items may be inspected, replaced, cleaned, adjusted, and/or serviced as required:

(*1*) Ignition system.

(*2*) Cold starting enrichment system (includes fast idle speed setting).

(*3*) Curb idle speed and air/fuel mixture.

(*4*) Drive belt tension on engine accessories.

(*5*) Valve lash.

(*6*) Inlet air and exhaust gas control valves.

(*7*) Engine bolt torque.

(*8*) Spark plugs.

(*9*) Fuel filter and air filter.

(*10*) Crankcase emission control system.

(*11*) Fuel evaporative emission control system.

(*12*) Exhaust gas recirculation system.

(B) Change of engine oil, and change or service of oil filter will be allowed at the equivalent intervals that will be specified in the manufacturer's maintenance instructions.

(C) Readjustment of the engine idle speed (curb idle and fast idle) may be performed, in addition to during scheduled major engine tuneups, once during the first 125 hours of engine operation.

(ii) Unscheduled maintenance may be performed on durability-data engines, except as provided in paragraph (c)(v)(A) of this section, only under the following provisions:

(A) Any persistently misfiring spark plug may be replaced, in addition to replacement at scheduled major engine tuneup points.

(B) Readjustment of the engine cold starting enrichment system may be performed if there is a problem of stalling or if there is visible black smoke.

(C) Readjustment of the engine idle speed (curb idle and fast idle) may be performed, in addition to that performed as scheduled maintenance under paragraph (c)(2)(i) of this section, if the idle speed exceeds the manufacturer's recommended idle speed by 300 r.p.m. or more, or if there is a problem of stalling.

(D) The idle mixture may be reset, other than during scheduled major engine tuneups, only with the advance approval of the Administrator.

(iii)—(iv) [Reserved]

(v) Any other engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement on durability-data engines shall be performed only with the advance approval of the Administrator.

(A) In the case of unscheduled maintenance such approval will be given if the Administrator:

(*1*) Has made a preliminary determination that part failure or system malfunction, or the repair of such failure or malfunction, does not render the engine unrepresentative of engines in use, and does not require direct access to the combustion chamber, except for spark plug, fuel injection component, or removable prechamber removal or replacement; and

(*2*) Has made a determination that the need for maintenance or repairs is indicated by an overt indication of malfunction such as persistent misfiring, engine stalling, overheating, fluid leakage, loss of oil pressure, excessive fuel consumption, or excessive power loss.

(B) Emission measurements may not be used as a means of determining the need for unscheduled maintenance under paragraph (c)(2)(v)(A)(*1*) of this section.

(C) Requests for authorization of scheduled maintenance of emission control-related components not specifically authorized to be maintained by these regulations must be made prior to the beginning of durability testing. The Administrator will approve the performance of such maintenance if the manufacturer makes a satisfactory showing that the maintenance will be performed on engines in use.

(vi) If the Administrator determines that part failure or system malfunction occurrence and/or repair rendered the engine unrepresentative of engines in use, the engine shall not be used as a durability-data engine.

(3)(i) Scheduled maintenance on emission-data engines is limited to the adjustment of idle speed once before the 125-hour test point, provided the idle speed is outside the manufacturer's specifications to be shown on the engine label (see § 86.077–35(a)(2)(iii)).

(ii) Any other engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement shall be performed only with the advance approval of the Administrator.

(4) [Reserved]

(5)(i) Complete emission tests (see §§ 86.777–5 through 86.777–15) are required unless waived by the Administrator, before and after:

(A) Scheduled maintenance approved for durability-data engines.

(B) Unscheduled maintenance which may reasonably be expected to affect emissions.

(ii) The tests before and after scheduled maintenance, which are performed on durability-data engines prior to 117 hours, are waived. The test before scheduled maintenance, which is performed on durability-data engines after 117 hours and prior to 133 hours, is waived. The after-maintenance test must be run and the results used in the deterioration factor calculation in accordance with § 86.077–28(b)(4)(i)(A)(2).

(iii) The idle speed reset and any scheduled maintenance on the emission-data engine shall be performed prior to the 125-hour test. The before-maintenance and after-maintenance tests associated with idle speed reset and scheduled maintenance on the emission-data engine are waived.

(iv) Test data required by this paragraph shall be air posted to the Administrator within 72 hours (or delivered within 5 working days), along with a complete record of all pertinent maintenance.

(v) When unscheduled maintenance is approved, a preliminary engineering report, unless waived by the Administrator, shall be air posted within 72 hours (or delivered within 5 working days). A final engineering report shall be delivered or air posted within 10 working days after the completion of the emission tests. The Administrator may approve an extension of the time requirements for the final engineering report.

(vi) All test data, maintenance reports, and required engineering reports shall be compiled and provided to the Administrator in accordance with § 86.077–23.

(6) The Administrator shall be given the opportunity to verify the existence of an overt indication of part failure and/or engine malfunction (e.g., misfiring, stalling).

(7) Equipment, instruments, or tools may not be used to identify malfunctioning, maladjusted, or defective engine components unless the same or equivalent equipment, instruments, or tools will be available to dealerships and other service outlets, and

(i) Are used in conjunction with scheduled maintenance on such components;

(ii) Are used subsequent to the identification of an engine failure or malfunction, as provided in paragraph (c)(2)(v)(A) of this section for durability-data engines or paragraph (c)(3) of this section for emission-data engines; or

(iii) Unless specifically authorized by the Administrator.

(d)(1) *Diesel heavy-duty engines.* Paragraph (d) of this section applies to Diesel heavy-duty engines.

(2)(i) Scheduled maintenance may be performed on durability-data engines only under the following provisions:

(A) One major engine servicing to manufacturer's specifications may be performed prior to 875 hours (±8 hours) of scheduled dynamometer operation provided such maintenance is requested in the application for certification and is specified in the maintenance instructions which will be furnished to the ultimate

purchaser of the motor vehicle in which the engine, which is represented by the test engine, is installed. (For equivalent dynamometer hours, engine hours, and mileage intervals, see § 86.077–2.) A scheduled major servicing shall be restricted to paragraphs (d)(2)(i)(A)(*1*) through (*7*) of this section and shall be conducted in a manner consistent with service instructions and specifications provided by the manufacturer for use by customer service personnel. The following items may be inspected, replaced, cleaned, adjusted, and/or serviced as required:

(*1*) Low idle speed.
(2) Drive belt tension.
(3) Engine bolt torque.
(4) Valve lash.
(5) Injection timing.
(6) Injector assemblies.
(7) Governor settings.

(B) Normal engine servicing such as engine oil change, and oil filter, fuel filter, and air filter cleaning or replacement will be allowed at manufacturer's recommended intervals. If approved in advance by the Administrator, the maintenance for these items may differ from that specified in the manufacturer's maintenance instructions.

(C) Readjustment of the engine low idle speed may be performed once during the first 125 hours of engine operation.

(ii) Unscheduled maintenance may be performed on durability-data engines, except as provided in paragraph (d)(2)(v)(A) of this section, only under the following provisions:

(A) Injectors may be changed if a persistent misfire is detected.

(B) Readjustment of the engine idle speed (curb idle and fast idle) may be performed, in addition to that performed as scheduled maintenance under paragraph (d)(2)(i) of this section, if the idle speed exceeds the manufacturer's recommended idle speed by 300 r.p.m. or more, or if there is a problem of stalling.

(iii)–(iv) [Reserved]

(v) Any other engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement on durability-data engines shall be performed only with the advance approval of the Administrator.

(A) In the case of unscheduled maintenance such approval will be given if the Administrator:

(*1*) Has made a preliminary determination that part failure or system malfunction, or the repair of such failure or malfunction, does not render the engine unrepresentative of engines in use, and does not require direct access to the combustion chamber, except for fuel injection component, or removable prechamber removal or replacement; and

(2) Has made a determination that the need for maintenance or repairs is indicated by an overt indication of malfunction such as persistent misfiring, engine stalling, overheating, fluid leakage, loss of oil pressure, excessive fuel consumption or excessive power loss.

(B) Emission measurements may not be used as a means of determining the need for unscheduled maintenance under paragraph (d)(2)(v)(A)(*1*) of this section.

(C) Requests for authorization of scheduled maintenance of emission control related components not specifically authorized to be maintained by these regulations must be made prior to the beginning of durability testing. The Administrator will approve the performance of such maintenance if the manufacturer makes a satisfactory showing that the maintenance will be performed on engines in use.

(vi) If the Administrator determines that part failure or system malfunction occurrence and/or repair rendered the engine unrepresentative of engines in use, the engine shall not be used as a durability-data engine.

(3)(i) Scheduled maintenance on emission-data engines is limited to the adjustment of idle speed once before the 125-hour test point, provided the idle speed is outside the manufacturer's specifications required to be shown on the engine label (see § 86.077–35(a)(3)(iii)).

(ii) Any other engine, emission control system, or fuel system, adjustment, repair, removal, disassembly, cleaning, servicing, or replacement shall be performed only with the advance approval of the Administrator.

(4) [Reserved]

(5)(i) Complete emission tests (see §§ 86.877–5 through 86.877–14 and §§ 86.977–5 through 86.977–15) are required, unless waived by the Administrator, before and after:

(A) Scheduled maintenance approved for durability-data engines.

(B) Unscheduled maintenance which may reasonably be expected to affect emissions.

(ii) The tests before and after scheduled maintenance, which are performed on durability-data engines prior to 117 hours, are waived. The test before scheduled maintenance, which is performed on durability-data engines after 117 hours and prior to 133 hours, is waived. The after-maintenance test must be run and the results used in the deterioration factor calculation in accordance with § 86.077–28(c)(4)(i)(B) or (C).

(iii) The idle speed reset and any scheduled maintenance on the emission-data engine shall be performed prior to the 125-hour test. The before-maintenance and after-maintenance tests associated with idle speed reset and scheduled maintenance on the emission-data engine are waived.

(iv) Test data required by this paragraph shall be air posted to the Administrator within 72 hours of test completion (or delivered within 5 working days), along with a complete record of all pertinent maintenance.

(v) When unscheduled maintenance is approved, a preliminary engineering report, unless waived by the Administrator, shall be air posted within 72 hours (or delivered within 5 working days). A final engineering report shall be delivered or air posted within 10 working days after the completion of the emission tests. The Administrator may approve an extension of the time requirements for the final engineering report.

(vi) All test data, maintenance reports, and required engineering reports shall be compiled and provided to the Administrator in accordance with § 86.077–23.

(6) The Administrator shall be given the opportunity to verify the existence of an overt indication of part failure and/or engine malfunction (e.g., misfiring, stalling).

(7) Equipment, instruments, or tools may not be used to identify malfunctioning, maladjusted, or defective engine components unless the same or equivalent equipment, instruments, or tools will be available to dealerships and other service outlets and

(i) Are used in conjunction with scheduled maintenance on such components;

(ii) Are used subsequent to the identification of an engine failure or malfunction, as provided in paragraph (d)(2)(v)(A) of this section for durability-data engines or paragraph (d)(3) of this section for emission-data engines; or

(iii) Unless specifically authorized by the Administrator.

§ 86.077–26 Mileage and service accumulation; emission measurements.

(a)(1) Paragraph (a) of this section applies to light-duty vehicles and light-duty trucks.

(2) The procedure for mileage accumulation will be the Durability Driving Schedule as specified in Appendix IV of this part. A modified procedure may also be used if approved in advance by the Administrator. Except with the advance approval of the Administrator, all vehicles will accumulate mileage at a measured curb weight which is within 100 pounds of the estimated curb weight. If the loaded vehicle weight is within 100 pounds of being included in the next higher inertia weight class as specified in § 86.177–11(d), the manufacturer may elect to conduct the respective emission tests at the inertia weight corresponding to the higher loaded vehicle weight.

(3) Emission-data vehicles: Unless as otherwise provided for in § 86.077–23(a), emission-data vehicles shall be operated and tested as follows:

(i) *Gasoline-fueled.* (A) Each gasoline-fueled emission-data vehicle shall be driven 6436 kilometers (4000 miles) with all emission control systems installed and operating. Complete exhaust emission and fuel evaporative emission tests (see § 86.177–5(a)) shall be conducted at zero kilometers (zero miles) and 6436 kilometers (4000 miles) unless the Administrator determines, based on data submitted under § 86.077–24(f), that only the exhaust emission test (see § 86.177–5(b)) shall be conducted at zero kilometers (zero miles) and 6436 kilometers (4000 miles).

(B) The emission-data vehicle(s) selected for testing under § 86.077–24(b)(1)(v) shall be driven 6436 kilometers (4000 miles) at any altitude. Emission tests shall be conducted at zero kilometers (zero miles) at any altitude and

6436 kilometers (4000 miles) under high altitude conditions.

(C) The emission-data vehicle(s) selected for testing under § 86.077–24(b)(1)(v) and permitted to be tested for purposes of § 86.077–23(c)(1)(ii) under the provisions of § 86.077–24(b)(1)(vi) shall be driven 6436 kilometers (4000 miles) at low altitude. Emission tests shall be conducted at zero kilometers (zero miles) at low altitude and 6436 kilometers (4000 miles) under both low- and high-altitude conditions. For the purposes of this subparagraph, "low altitude" means any elevation less than 549 meters (1800 feet).

(ii) *Diesel.* (A) Each Diesel emission-data vehicle shall be driven 6436 kilometers (4000 miles) with all emission control systems installed and operating. Emission tests shall be conducted at zero kilometers (zero miles) and 6436 kilometers (4000 miles).

(B) The emission-data vehicle(s) selected for testing under § 86.077–24(b)(1)(v) shall be driven 6436 kilometers (4000 miles) at any altitude. Emission tests shall be conducted at zero kilometers (zero miles) at any altitude and 6436 kilometers (4000 miles) under high altitude conditions.

(C) The emission-data vehicle(s) selected for testing under § 86.077–24(b)(1)(v) and permitted to be tested for purposes of § 86.077–23(c)(1)(ii) under the provisions of § 86.077–24(b)(1)(vi) shall be driven 6436 kilometers (4000 miles) at low altitude. Emission tests shall be conducted at zero kilometers (zero miles) at low altitude and 6436 kilometers (4000 miles) under both low- and high-altitude conditions. For the purpose of this subparagraph "low altitude" means any elevation less than 549 meters (1800 feet).

(4) Durability-data vehicles: Unless as otherwise provided for in § 86.077–23(a), durability-data vehicles shall be operated and tested as follows:

(i) *Gasoline-fueled.* Each gasoline-fueled durability-data vehicle shall be driven, with all emission control systems installed and operating, for 50,000 miles or such lesser distance as the Administrator may agree to as meeting the objective of this procedure. Complete exhaust emission and fuel evaporative emission tests (see § 86.177–5(a)) shall be made at the following mileage points: 0, 5,000, 10,000, 15,000, 20,000, 25,000, 30,000, 35,000, 40,000, 45,000 and 50,000, unless the Administrator determines based on data submitted under § 86.077–24(f) that only the exhaust emission tests (see § 86.177–5(b)) shall be made at the mileage points specified in this paragraph.

(ii) *Diesel.* Each Diesel durability-data vehicle shall be driven, with all emission control systems installed and operating, for 50,000 miles or such lesser distance as the Administrator may agree to as meeting the objectives of this procedure. Complete emission tests (see §§ 86.177–6 through 86.177–23) shall be made at the following mileage points: 0, 5,000, 10,000, 15,000, 20,000, 25,000, 30,000, 35,000, 40,000, 45,000, and 50,000.

(5) All tests required by this subpart to be conducted after every 5,000 miles of driving for durability-data vehicles and 4,000 miles for emission-data vehicles must be conducted at any accumulated mileage within 250 miles of each of those test points.

(6)(i) The results of each emission test shall be supplied to the Administrator immediately after the test. The manufacturer shall furnish to the Administrator explanation for voiding any test. The Administrator will determine if voiding the test was appropriate based upon the explanation given by the manufacturer for the voided test. If a manufacturer conducts multiple tests at any test point at which the data are intended to be used in the calculation of the deterioration factor, the number of tests must be the same at each point and may not exceed three valid tests. Tests between test points may be conducted as required by the Administrator. Data from all tests (including voided tests) shall be air posted to the Administrator within 24 hours (or delivered within 3 working days). In addition, all test data shall be compiled and provided to the Administrator in accordance with § 86.077–23. Where the Administrator conducts a test on durability-data vehicle at a prescribed test point, the results of that test will be used in the calculation of the deterioration factor.

(ii) The results of all emission tests shall be rounded, using the "Rounding Off Method" specified in ASTM E 29–67, to the number of places to the right of the decimal point indicated by expressing the applicable emission standards of this subpart to three significant figures.

(7) Whenever the manufacturer proposes to operate and test a vehicle which may be used for emission or durability data, he shall provide the zero-mile test data to the Administrator (except for those vehicles for which the zero-mile test requirement has been waived under § 86.077–23(a)(2)) and make the vehicle available for such testing under § 86.077–29 as the Administrator may require before beginning to accumulate mileage on the vehicle. Failure to comply with this requirement will invalidate all test data submitted for this vehicle.

(8) Once a manufacturer begins to operate an emission-data or durability-data vehicle, as indicated by compliance with paragraph (a)(7) of this section, he shall continue to run the vehicle to 4,000 miles or 50,000 miles, respectively, and the data from the vehicle will be used in the calculations under § 86.077–28. Discontinuation of a vehicle shall be allowed only with the written consent of the Administrator.

(9)(i) The Administrator may elect to operate and test any test vehicle during all or any part of the mileage accumulation and testing procedure. In such cases, the manufacturer shall provide the vehicle(s) to the Administrator with all information necessary to conduct this testing.

(ii) The test procedures in §§ 86.177–5 through 86.177–23 will be followed by the Administrator. The Administrator will test the vehicles at each test point. Maintenance may be performed by the manufacturer under such conditions as the Administrator may prescribe.

(iii) The data developed by the Administrator for the engine-system combination shall be combined with any applicable data supplied by the manufacturer on other vehicles of that combination to determine the applicable deterioration factors for the combination. In the case of a significant discrepancy between data developed by the Administrator and that submitted by the manufacturer, the Administrator's data shall be used in the determination of deterioration factors.

(10) Emission testing of any type with respect to any certification vehicle other than that specified in this part is not allowed except as such testing may be specifically authorized by the Administrator.

(b)(1) Paragraph (b) of this section applies to gasoline-fueled heavy-duty engines.

(2) The engine dynamometer service accumulation schedule will consist of several operating conditions which give the same percentage of time at various manifold vacuums and modes as specified in the emission test cycle. The average speed shall be between 1,650 and 1,700 r.p.m. Subject to the requirements as to average speed, there must be operation at speeds in excess of 3,200 r.p.m. (but not in excess of governed speed for governed engines or rated speed for non-governed engines) for a cumulative maximum of 0.5 percent of the actual cycle time, excluding time in transient conditions. Maximum cycle time shall be 15 minutes. A cycle approved in advance by the Administrator shall be used.

(3) Emission-data engines: Unless as otherwise provided for in § 86.077–23(a), emission-data engines shall be operated and tested as follows: Each emission-data engine shall be operated for 125 hours with all emission control systems installed and operating. Emission tests shall be conducted at zero and 125 hours. Evaporative emission controls need not be connected provided normal operating conditions are maintained in the engine induction system.

(4) Durability-data engines: Unless as otherwise provided for in § 86.077–23(a), durability-data engines shall be operated and tested as follows: Each durability-data engine shall be operated, with all emission control systems installed and operating, for 1,500 hours. Emission tests shall be conducted at zero hours and at each 125-hour interval. Evaporative emission controls need not be connected provided normal operating conditions are maintained in the engine induction system.

(5) All tests required by this subpart to be conducted after 125 hours of operation or at any multiple of 125 hours may be conducted at any accumulated number of hours within 8 hours of 125 hours or the appropriate multiple of 125 hours, respectively.

(6)(i) The results of each emission test shall be supplied to the Administrator within 72 hours (or delivered within

5 working days). The manufacturer shall furnish to the Administrator an explanation for voiding any test. The Administrator will determine if voiding the test was appropriate based upon the explanation given by the manufacturer for the voided test. If a manufacturer conducts multiple tests at any test point at which the data are intended to be used in the calculation of the deterioration factor, the number of tests must be the same at each point and may not exceed three valid tests. Tests between test points may be conducted as required by the Administrator. Data from all tests (including voided tests) shall be air posted to the Administrator within 72 hours (or delivered within 5 working days). In addition, all test data shall be compiled and provided to the Administrator in accordance with § 86.077–23. Where the Administrator conducts a test on a durability-data engine at a prescribed test point, the results of that test will be used in the calculation of the deterioration factor.

(ii) The results of all emission tests shall be recorded and reported to the Administrator using two places to the right of the decimal point. These numbers shall be rounded in accordance with the "Rounding Off Method" specified in ASTM E 29–67.

(7) Whenever the manufacturer proposes to operate and test an engine which may be used for emission or durability data, he shall provide the zero-hour test data to the Administrator (except for those engines for which the zero-hour test requirement has been waived under § 86.077–23(a)(2)) and make the engine available for such testing under § 86.077–29 as the Administrator may require before beginning to accumulate hours on the engine. Failure to comply with this requirement will invalidate all test data later submitted for this engine.

(8) Once a manufacturer begins to operate an emission-data or durability-data engine, as indicated by compliance with paragraph (b)(7) of this section, he shall continue to run the engine to 125 hours or 1,500 hours, respectively, and the data from the engine will be used in the calculations under § 86.777–15. Discontinuation of an engine shall be allowed only with the prior written consent of the Administrator.

(9)(i) The Administrator may elect to operate and test any test engine during all or any part of the service accumulation and testing procedure. In such cases the manufacturer shall provide the engine(s) to the Administrator with all information necessary to conduct the testing.

(ii) The test procedures (§§ 86.777–5 through 86.777–15) will be followed by the Administrator. The Administrator will test the engines at each test point. Maintenance may be performed by the manufacturer under such conditions as the Administrator may prescribe.

(iii) The data developed by the Administrator for the engine-system combination shall be combined with any applicable data supplied by the manufacturer on other engines of that combination to determine the applicable deterioration factors for the combination. In the case of a significant discrepancy between data developed by the Administrator and that submitted by the manufacturer, the Administrator's data shall be used in the determination of deterioration factors.

(10) Emission testing of any type with respect to any certification engine other than that specified in this subpart is not allowed except as such testing may be specifically authorized by the Administrator.

(c)(1) Paragraph (c) of this section applies to Diesel heavy-duty engines.

(2) The procedures set forth in this section describe the service accumulation that shall be accomplished on each test engine and when tests are to be conducted.

(3)(i) Emission-data engines: Unless as otherwise provided for in § 86.077–23(a), emission-data engines shall be operated and tested as follows: Each emission-data engine shall be operated for 125 hours with all emission control systems installed and operating. Emission tests shall be conducted at zero and 125 hours.

(ii) Durability-data engines: Unless as otherwise provided for in § 86.077–23(a), durability-data engines shall be operated and tested as follows: Each durability-data engine shall be operated, with all emission control systems installed and operating, for 1,000 hours. Emission tests shall be conducted at zero hours and at each 125-hour interval.

(4) A break-in procedure, not to exceed 20 hours, may be run if approved in writing in advance by the Administrator. This procedure would run after the zero-hour test, and the hours accumulated would not be counted as part of the service accumulation.

(5) Before service accumulation can begin, the following criteria must be met. Failure to comply with these requirements shall invalidate all test data submitted for an engine.

(i) Each engine shall produce at least 95 percent of the maximum horsepower, corrected to rating conditions, at 90 to 100 percent of the rated speed.

(ii) The fuel rate at maximum horsepower shall be within manufacturer's specifications.

(iii) The zero-hour test data shall be provided to the Administrator (except for those engines for which the zero-hour test requirement has been waived under § 86.077–23(a)(2)) and the engine shall be made available for such testing under § 86.077–29 as the Administrator may require.

(6) During service accumulation, hours can be credited toward the required service accumulation hours when the following criteria are met. If these criteria cannot be met, engine operation shall be discontinued and the Administrator shall be notified immediately. (Adjustments to the fuel rate can be approved under the provisions of § 86.077–25).

(i) Each engine shall produce at least 95 percent of the maximum horsepower, at 95 to 100 percent of the rated speed, observed during zero-hour testing. Horsepower values shall be corrected to the rating conditions.

(ii) The engine shall be operated at 75 percent of the inlet and exhaust restrictions specified in § 86.077–8 except that the tolerance will be ±3 inches of water and ±0.5 inches of Hg respectively.

(7) During each emission test the inlet and exhaust restrictions shall be as specified in § 86.077–8.

(8) Tests, other than zero-hour tests, may be conducted within eight (8) hours of the nominal test point.

(9)(i) The results of each emission test shall be air posted to the Administrator within 72 hours of test completion (or delivered within 5 working days). The manufacturer shall furnish to the Administrator an explanation for voiding any test. The Administrator will determine if voiding the test was appropriate based upon the explanation given by the manufacturer for the voided test. If a manufacturer conducts multiple tests (not to exceed three valid tests) at any test point, the number of tests must be the same at each point. The data obtained from all valid tests shall be used in the calculation of the deterioration factor. Tests between test points may be conducted as required by the Administrator. Data from all tests (including voided tests) shall be air posted to the Administrator within 72 hours (or delivered within 5 working days). In addition, all test data shall be compiled and provided to the Administrator in accordance with § 86.077–23. Where the Administrator conducts a test on a durability-data engine at a prescribed test point, the results of that test will be used in the calculation of the deterioration factor.

(ii) The results of all emission tests shall be recorded and reported to the Administrator using two places to the right of the decimal point. These numbers shall be rounded in accordance with the "Rounding Off Method" specified in ASTM E 29–67.

(10) Once a manufacturer begins to operate an emission-data or durability-data engine, as indicated by compliance with paragraph (c) of this section, he shall continue to run the engine to 125 hours or 1,000 hours respectively, and the data from the engine shall be used in the calculations under §§ 86.877–14 and 86.977–15. Discontinuation of an engine shall be allowed only with the prior written consent of the Administrator.

(11)(i) The Administrator may elect to operate and test any test engine during all or any part of the service accumulation and testing procedure. In such cases, the manufacturer shall provide the engine(s) to the Administrator with all information necessary to conduct the testing.

(ii) The test procedures (§§ 86.877–5 through 86.877–14 and §§ 86.977–5 through 86.977–15) will be followed by the Administrator. The Administrator will test the engines at each test point. Maintenance may be performed by the manufacturer under such conditions as the Administrator may prescribe.

(iii) The data developed by the Administrator for the engine-system combination shall be combined with any applicable data supplied by the manufacturer on other engines of that combination to determine the applicable deterioration factors for the combination. In the case of a significant discrepancy between data developed by the Administrator and that submitted by the manufacturer, the Administrator's data shall be used in the determination of deterioration factors.

(12) Emission testing of any type with respect to any certification engine other than that specified in this part is not allowed except as such testing may be specifically authorized by the Administrator.

§ 86.077–27 Special test procedures.

(a) For light-duty vehicles or light-duty trucks, the Administrator may, on the basis of a written application therefore by a manufacturer, prescribe test procedures other than those set forth in this part for any motor vehicle which he determines is not susceptible to satisfactory testing by the procedures set forth in Subpart B.

(b) For heavy-duty engines, the Administrator may prescribe test procedures other than those set forth in this part for any motor vehicle engine which he determines is not susceptible to satisfactory testing by the procedures set forth in Subparts H, I, or J.

§ 86.077–28 Compliance with emission standards.

(a)(1) Paragraph (a) of this section applies to light-duty vehicles and light-duty trucks.

(2) The applicable exhaust and fuel evaporative emission standards of this subpart apply to the emissions of vehicles for their useful life.

(3) Since it is expected that emission control efficiency will change with mileage accumulation on the vehicle, the emission level of a vehicle which has accumulated 50,000 miles will be used as the basis for determining compliance with the standards.

(4) The procedure for determining compliance of a new motor vehicle with exhaust and fuel evaporative emission standards, as applicable, is as follows:

(i) Separate emission deterioration factors shall be determined from the emission results of the durability-data vehicle(s) for each engine-system combination. A separate factor shall be established for exhaust HC, exhaust CO, exhaust NO_x, and fuel evaporative HC, as applicable.

(A) The applicable results to be used in determining the deterioration factors for each combination shall be:

(*1*) All valid emission data from the tests required under § 86.077–26(a)(4), except the zero-mile tests. This shall include the official test results, as determined in § 86.077–29 for all tests conducted on all durability-data vehicles of the combination selected under § 86.077–24(c) (including all vehicles elected to be operated by the manufacturer under § 86.077–24(c)(1)(ii)).

(*2*) All emission data from the tests conducted before and after the scheduled maintenance provided in § 86.077–25.

(*3*) All emission data from tests required by maintenance approved under § 86.077–25, in those cases where the Administrator conditioned his approval for the performance of such maintenance on the inclusion of such data in the deterioration factor calculation.

(B) All applicable results shall be plotted as a function of the mileage on the system, rounded to the nearest mile, and the best fit straight lines, fitted by the method of least squares, shall be drawn through all these data points. The interpolated 4,000- and 50,000-mile points on this line must be within the standards provided in §§ 86.077–8 or 86.077–9, as applicable, or the data will not be acceptable for use in calculation of a deterioration factor, unless no applicable data point exceeded the standard.

(C) An exhaust emission deterioration factor shall be calculated for each combination as follows:

Factor=exhaust emissions interpolated to 50,000 miles divided by exhaust emissions interpolated to 4,000 miles.

These interpolated values shall be carried out to a minimum of four places to the right of the decimal point before dividing one by the other to determine the deterioration factor. The results shall be rounded to three places to the right of the decimal point in accordance with ASTM E 29–67.

(D) For gasoline-fueled vehicles, an evaporative emission deterioration factor shall be calculated for each combination by subtracting the evaporative emissions interpolated to 4,000 miles from the evaporative emissions interpolated to 50,000 miles. These interpolated values shall be carried out, in accordance with ASTM E 29–67, to a minimum of three decimal places to the right of the decimal point before subtracting one from the other to determine the deterioration factor.

(ii)(A) The exhaust emission test results for each emission-data vehicle shall be multiplied by the appropriate deterioration factor, *Provided*, That if a deterioration factor as computed in paragraph (a)(4)(i)(C) of this section is less than one, that deterioration factor shall be one for the purposes of this paragraph.

(B) The evaporative emission test results for each combination shall be adjusted by addition of the appropriate deterioration factor. *Provided*, That if a deterioration factor as computed in paragraph (a)(4)(i)(D) of this section is less than zero, that deterioration factor shall be zero for the purposes of this paragraph.

(iii) The emissions to compare with the standard shall be the adjusted emissions of paragraphs (a)(4)(ii)(A) and (B) of this section for each emission-data vehicle. Before any emission value is compared with the standard, it shall be rounded, in accordance with ASTM E 29–67, to two significant figures. The rounded emission values may not exceed the standard.

(iv) Every test vehicle of an engine family must comply with all applicable standards, as determined in paragraph (a)(4)(iii) of this section, before any vehicle in that family may be certified.

(b)(1) Paragraph (b) of this section applies to gasoline-fueled heavy-duty engines.

(2) The exhaust emission standards in § 86.077–10 apply to the emissions of engines for their useful life.

(3) Since emission control efficiency decreases with the accumulation of hours on the engine, the emission level of an engine which has accumulated 1,500 hours of dynamometer operation will be used as the basis for determining compliance with the standards.

(4) The procedure for determining compliance of a new engine with exhaust emission standards is as follows:

(i) Separate emission deterioration factors shall be determined from the emission results of the durability-data engines for each engine-system combination. Separate factors shall be established for CO and for the combined emissions of HC and NO_x.

(A) The applicable results to be used in determining the deterioration factors for each combination shall be:

(*1*) All valid emission data from the test required under § 86.077–26(b)(4), except the zero-hour tests. This shall include the official test results, as determined in § 86.077–29, for all tests conducted on all durability-data engines of the combination selected under § 86.077–24(c)(2) (including all engines elected to be operated by the manufacturer under § 86.077–24(c)(2)(iii)).

(*2*) All emission data from the test conducted before and after maintenance provided in § 86.077–25(c)(2)(i)(A).

(*3*) All emission data from the test conducted before and after maintenance provided in § 86.077–25(c)(2)(v)(C) if emission tests were conducted.

(B) All applicable emission results for (*1*) HC+NO_x and (*2*) CO shall be plotted as a function of durability hours which shall be consistently rounded to the nearest hour. Emission data shall have two figures to the right of the decimal. The best fit straight lines ((*1*) HC+NO_x and (*2*) CO), fitted by the method of least squares, shall be drawn through these data points. The interpolated 125-hour and 1500-hour points on each line, rounded to whole numbers in accordance with ASTM E 29–67, must be within the standards specified in § 86.077–10 or the data shall not be used in the calculation of a deterioration factor, unless no applicable data points exceed the standards.

(C) The interpolated values shall be used to calculate a deterioration factor as follows:

Factor=Exhaust emissions interpolated to 1500 hours minus the exhaust emissions interpolated to 125 hours. (Negative deterioration factors shall be considered zero.)

(ii) The appropriate deterioration factor, carried out to two places to the right of the decimal point, shall be added to the exhaust emission test results, carried out to two places to the right of

the decimal point, for each emission-data engine.

(iii) The emission values to compare with the standards shall be the adjusted emission values of paragraph (b)(4)(ii) of this section rounded to whole numbers in accordance with ASTM E 29–67 for each emission-data engine.

(iv) Every test engine of an engine family must comply with all applicable standards, as determined in paragraph (b)(4)(iii) of this section, before any engine in that family will be certified.

(c)(1) Paragraph (c) of this section applies to Diesel heavy-duty engines.

(2) The emission standards in § 86.077–11 apply to the emissions of engines for their useful lives.

(3) Since emission control efficiency decreases with accumulation of hours on the engine, the emission level of an engine which has accumulated 1,000 hours of dynamometer operation will be used as the basis for determining compliance with the standards.

(4) The procedure for determining compliance with emission standards for Diesel heavy-duty engines is as follows:

(i) Emission deterioration factors for the acceleration mode (designated as "A"), the lugging mode (designated as "B"), the peak opacity (designated as "C"), the CO exhaust emissions, and the $HC+NO_x$ exhaust emissions shall be established separately for each engine-system combination.

(A) The applicable results to be used in determining the deterioration factors for each combination shall be:

(*1*) All emission data from the tests required under § 86.077–26(c)(3)(ii), except the zero-hour tests. This shall include the official test results, as determined in § 86.077–29, for all tests conducted on all durability-data engines of the combination selected under § 86.077–24(c)(3)(i) (including all engines selected to be operated by the manufacturer under § 86.077–24(c)(3)(ii)).

(*2*) All emission data from the tests conducted before and after the maintenance provided in § 86.077–25(d)(2)(i)(A) if emission tests were conducted.

(*3*) All emission data from the tests conducted before and after maintenance provided in § 86.077–25(d)(2)(v)(C) if emission tests were conducted.

(B) All applicable emission results for (1) $HC+NO_x$, (2) CO, (3) acceleration smoke ("a"), (4) lugging smoke ("b"), and (5) peak smoke ("c") shall be plotted as a function of durability hours which shall be consistently rounded to the nearest hour. Emission data shall have two figures to the right of the decimal. The best fit straight lines, fitted by the method of least squares, shall be drawn through these data points. The interpolated 125- and 1000-hour points on each line, rounded to whole numbers in accordance with ASTM E 29–67, must be within the standards specified in § 86.077–11 or the data shall not be used in the calculation of the deterioration factor, unless no applicable data points exceeded the standards.

(C) The interpolated values shall be used to calculate a deterioration factor as follows:

Factor = Exhaust emissions (both smoke and gaseous) interpolated to 1000 hours minus the exhaust emissions interpolated to 125 hours. (Negative deterioration factors shall be considered zero).

(ii) The appropriate deterioration factor, carried out to two places to the right of the decimal point, shall be added to the exhaust emission test results, carried out to two places to the right of the decimal point, for each emission-data engine.

(iii) The emission values to compare with the standards shall be the adjusted emission values of paragraph (c)(4)(ii) of this section rounded to whole numbers in accordance with ASTM E 29–67 for each emission-data engine.

(iv) Every test engine of an engine family must comply with all applicable standards, as determined in paragraph (c)(4)(iii) of this section, before any engine in that family will be certified.

§ 86.077–29 Testing by the Administrator.

(a)(1) Paragraph (a) of this section applies to light-duty vehicles and light-duty trucks.

(2) The Administrator may require that any one or more of the test vehicles be submitted to him, at such place or places as he may designate, for the purposes of conducting emissions tests. The Administrator may specify that he will conduct such testing at the manufacturer's facility, in which case instrumentation and equipment specified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(3)(i) Whenever the Administrator conducts a test on a test vehicle, the results of that test shall, unless subsequently invalidated by the Administrator, comprise the official data for the vehicle at the prescribed test point and the manufacturer's data for that prescribed test point shall not be used in determining compliance with emission standards.

(ii) Whenever the Administrator does not conduct a test on a test vehicle at a test point, the manufacturer's test data will be accepted as the official data for that test point, *Provided*, That if the Administrator makes a determination based on testing under paragraph (a)(2) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer, *And further provided*, That if the Administrator has reasonable basis to believe that any test data submitted by the manufacturer are not accurate or have been obtained in violation of any provisions of this part, the Administrator may refuse to accept those data as the official data pending retesting or submission or further information.

(iii)(A) The emission-data vehicle presented to the Administrator for testing shall be calibrated within the production tolerances applicable to the manufacturer's specifications to be shown on the vehicle label (see § 86.077–35(a)(1)(iii)(D)) as specified in the application for certification. If the Administrator determines that a vehicle is not within such tolerances, the vehicle shall be adjusted, at the facility designated by the Administrator, prior to the test and an engineering report shall be submitted to the Administrator describing the corrective action taken. Based on the engineering report, the Administrator will determine if the vehicle shall be used as an emission-data vehicle.

(B) If the Administrator determines that the test data developed under paragraph (a)(3)(iii)(A) of this section would cause an emission-data vehicle to fail due to excessive 4,000 mile emissions or by application of the appropriate deterioration factor, then the following procedure shall be observed:

(*1*) The manufacturer may request a retest. Before the retest, the vehicle may be readjusted to manufacturer's specifications, if these adjustments were made incorrectly prior to the first test, and other maintenance or repairs may be performed in accordance with § 85.077–25. All work on the vehicle shall be done at such location and under such conditions as the Administrator may prescribe.

(*2*) The vehicle will be retested by the Administrator and the results of this test shall comprise the official data for the emission-data vehicle.

(iv) If sufficient durability data are not available at the time of any emission test conducted under paragraph (a)(2) of this section to enable the Administrator to determine whether an emission-data vehicle would fail, the manufacturer may request a retest in accordance with the provisions of paragraphs (a)(3)(iii)(A) and (B) of this section. If the manufacturer does not promptly make such request, he shall be deemed to have waived the right to a retest. A request for retest must be made before the manufacturer removes the vehicle from the test premises.

(b)(1) Paragraph (b) of this section applies to heavy-duty engines.

(2) The Administrator may require that any one or more of the test engines be submitted to him, at such place or places as he may designate, for the purpose of conducting emissions tests. The Administrator may specify that he will conduct such testing at the manufacturer's facility, in which case instrumentation and equipment specified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(3)(i) Whenever the Administrator conducts a test on a test engine the results of that test, unless subsequently invalidated by the Administrator, shall comprise the official data for the engine at that prescribed test point and the manufacturer's data for that prescribed

test point shall not be used in determining compliance with emission standards.

(ii) Whenever the Administrator does not conduct a test on a test engine at a test point, the manufacturer's test data will be accepted as the official data for that test point, *Provided*, That if the Administrator makes a determination based on testing under paragraph (b)(2) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer, *And further provided*, That if the Administrator has reasonable basis to believe that any test data submitted by the manufacturer is not accurate or has been obtained in violation of any provision of this part, the Administrator may refuse to accept that data as the official data pending retesting or submission of further information.

(iii)(A) The emission-data engine presented to the Administrator for testing shall be calibrated within the production tolerances applicable to the manufacturer's specifications to be shown on the engine label (see § 86.077–35(a)(2)(iii)) as specified in the application for certification. If the Administrator determines that an engine is not within such tolerances, the engine shall be adjusted at the facility designated by the Administrator prior to the test and an engineering report shall be submitted to the Administrator describing the corrective action taken. Based on the engineering report the Administrator will determine if the engine shall be used as an emission-data engine.

(B) If the Administrator determines that the test data developed under paragraph (b)(3)(iii)(A) of this section would cause the emission-data engine to fail due to excessive 125-hour emission values or by the application of the appropriate deterioration factor, then the following procedure shall be observed.

(*1*) The manufacturer may request a retest. Before the retest, the engine may be readjusted to manufacturer's specifications, if these adjustments were made incorrectly prior to the first test, and other maintenance or repairs may be performed in accordance with § 86.077–25. All work on the engine shall be done at such location and under such conditions as the Administrator may prescribe.

(*2*) The engine will be retested by the Administrator and the results of this test shall comprise the official data for the emission-data engine.

(iv) If sufficient durability data are not available at the time of any emission test conducted under paragraph (b)(2) of this section to enable the Administrator to determine whether an emission-data engine would fail, the manufacturer may request a retest in accordance with the provisions of paragraphs (b)(3)(iii)(B)(*1*) and (*2*) of this section. If the manufacturer does not promptly make such request, he shall be deemed to have waived the right to a retest. A request for retest must be made before the manufacturer removes the engine from the test premises.

§ 86.077–30 Certification.

(a)(1) If, after a review of the test reports and data submitted by the manufacturer, data derived from any inspection carried out under § 86.077–7(c) and any other pertinent data or information, the Administrator determines that a test vehicle(s) (or test engine(s)) meets the requirements of the Act and of this subpart, he will issue a certificate of conformity with respect to such vehicle(s) (or engine(s)) except in cases covered by paragraph (c) of this section. If applicable, the certificate will state which vehicles are certified for sale at high altitude.

(2) Such certificate will be issued for such period not to exceed one model year as the Administrator may determine and upon such terms as he may deem necessary to assure that any new motor vehicle (or new motor vehicle engine) covered by the certificate will meet the requirements of the Act and of this part. Each such certificate shall contain the following language:

This certificate covers only those new motor vehicles (or new motor vehicle engines) which conform, in all material respects, to the design specifications that applied to those vehicles (or engines) described in the application for certification and which are produced during the ____ model year production period of the said manufacturer, as defined in 40 CFR 86.077–2.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 86.077–7(c) which concern either the vehicle (or engine) certified, or any production vehicle (or production engine) covered by this certificate, or any production vehicle (or production engine) which when completed will be claimed to be covered by this certificate. Failure to comply with all the requirements of § 86.077–7(c) with respect to any such vehicle (or engine) may lead to revocation or suspension of this certificate as specified in 40 CFR 86.077–30(c). It is also a term of this certificate that this certificate may be revoked or suspended for the other reasons stated in § 86.077–30 (c) or (d).

(3) One such certificate will be issued for each engine family and will certify compliance with no more than one set of applicable standards.

(4) A violation of section 203(a)(1) of the Clean Air Act occurs when any manufacturer sells, offers for sale, introduces or delivers for introduction into commerce, any light-duty vehicle or light-duty truck, subject to the regulations under the Act, which is not covered by a certificate of conformity at high altitude issued under this part:

(i) At a designated high-altitude location, unless such manufacturer has substantial reason to believe that such motor vehicle will not be sold to an ultimate purchaser for principal use at a designated high-altitude location; or,

(ii) At an other than a designated high-altitude location, when such manufacturer has reason to believe that such motor vehicle is intended by the ultimate purchaser to be used principally at a designated high-altitude location.

(5) For the purpose of paragraph (a) of this section, "designated high-altitude location" is any county which has substantially all of its area located above 1219 meters (4,000 feet) and which is identified below.

COUNTIES LOCATED SUBSTANTIALLY ABOVE 1,219 METERS (4,000 FEET) IN ELEVATION

STATE OF ARIZONA	
Apache	Navajo
STATE OF COLORADO	
Adams	Jefferson
Alamosa	Lake
Arapahoe	La Plata
Archuleta	Larimer
Boulder	Las Animas
Chaffee	Lincoln
Clear Creek	Mesa
Conejos	Mineral
Costilla	Moffat
Crowley	Montezuma
Custer	Montrose
Dolores	Morgan
Delta	Ouray
Denver	Park
Douglas	Pitkin
Eagle	Pueblo
Elbert	Rio Blanco
El Paso	Rio Grande
Fremont	Routt
Garfield	Saguache
Gilpin	San Juan
Grand	San Miguel
Gunnison	Summit
Hinsdale	Teller
Huerfano	Washington
Jackson	Weld
STATE OF IDAHO	
Bannock	Custer
Bear Lake	Franklin
Bingham	Fremont
Blaine	Jefferson
Bonneville	Madison
Butte	Minidoka
Camas	Oneida
Caribou	Power
Cassia	Teton
Clark	Valley
STATE OF MONTANA	
Beaverhead	Madison
Deer Lodge	Meagher
Gallatin	Park
Jefferson	Silver Bow
STATE OF NEBRASKA	
Banner	Sioux
Kimball	
STATE OF NEVADA	
Carson City	Lander
Douglas	Lyon
Elko	Mineral
Esmeralda	Storey
Eureka	White Pine
Humboldt	
STATE OF NEW MEXICO	
Bernalillo	Mora
Catron	Rio Arriba
Colfax	Sandoval
Curry	San Juan
De Baca	San Miguel
Grant	Santa Fe
Guadalupe	Sierra
Harding	Socorro
Lincoln	Taos
Los Alamos	Torrance
Luna	Union
McKinley	Valencia
STATE OF OREGON	
Lake	

STATE OF UTAH

Beaver	Piute
Box Elder	Rich
Cache	Salt Lake
Carbon	San Juan
Daggett	Sanpete
Davis	Sevier
Duchesne	Summit
Emery	Tooele
Grand	Uintah
Iron	Utah
Juab	Wasatch
Kane	Wayne
Millard	Weber
Morgan	

STATE OF WYOMING

Albany	Natrona
Carbon	Niobrara
Converse	Park
Fremont	Platte
Goshen	Sublette
Hot Springs	Sweetwater
Johnson	Teton
Laramie	Uinta
Lincoln	Weston

(6) The provisions of paragraph (a)(4) of this section shall not apply to any light-duty vehicle or light-duty truck, sold, offered for sale, introduced, or delivered for introduction into commerce in California, provided that the vehicle is covered by a certificate of conformity with emission standards in effect in California.

(7) Certificates issued for light-duty vehicles or light-duty trucks certified with catalytic converters shall be subject to the following term in addition to the term in paragraph (a)(2) of this section; "Catalyst-equipped vehicles, otherwise covered by this certificate, which are driven outside the United States, Canada, and Mexico will be presumed to have been operated on leaded gasoline resulting in deactivation of the catalysts. If these vehicles are imported or offered for importation without retrofit of the catalyst, they will be considered not to be within the coverage of this certificate unless included in a catalyst control program operated by a manufacturer or a United States Government Agency and approved by the Administrator."

(b)(1) The Administrator will determine whether a vehicle (or engine) covered by the application complies with applicable standards by observing the following relationships:

(i) *Light-duty vehicles and light-duty trucks.*

(A) A test vehicle selected under § 86.077-24(b)(1)(ii) or (iv) shall represent all vehicles in the same engine family of the same engine displacement-exhaust emission control system-evaporative emission control system combination, as applicable, to be sold below 1219 meters (4,000 feet) in elevation.

(B) A test vehicle selected under § 86.077-24(b)(1)(iii) shall represent all vehicles in the same engine family of the same engine displacement-exhaust emission control system-transmission type-fuel system combination to be sold below 1219 meters (4,000 feet) in elevation.

(C) A test vehicle selected under § 86.077-24(c)(1)(i) shall represent all vehicles of the same engine-system combination.

(D) A test vehicle selected under § 86.077-24(b)(1)(v) shall represent all vehicles of the same engine-system combination to be sold at high altitude.

(ii) *Gasoline-fueled heavy-duty engines.*

(A) A test engine selected under § 86.077-24(b)(2)(ii) and (iv) shall represent all engines in the same engine family of the same engine displacement-exhaust emission control system combination.

(B) A test engine selected under § 86.077-24(b)(2)(iii) shall represent all engines in the same engine family of the same engine displacement-exhaust emission control system combination.

(C) A test engine selected under § 86.077-24(c)(2)(i) shall represent all engines of the same engine-system combination.

(iii) *Diesel heavy-duty engines.*

(A) A test engine selected under § 86.077-24(b)(3)(ii) shall represent all engines in the same engine-system combination.

(B) A test engine selected under § 86.077-24(b)(3)(iii) shall represent all engines of that emission control system at the rated fuel delivery of the test engine.

(C) A test engine selected under § 86.077-24(c)(3)(i) shall represent all engines of the same engine-system combination.

(2) The Administrator will proceed as in paragraph (a) of this section with respect to the vehicles (or engines) belonging to an engine family all of which comply with applicable standards.

(3) If, after a review of the test reports and data submitted by the manufacturer, data derived from any additional testing conducted pursuant to § 86.077-29, data or information derived from any inspection carried out under § 86.077-7(c) or any other pertinent data or information, the Administrator determines that one or more test vehicles (or test engines) of the certification test fleet do not meet applicable standards, he will notify the manufacturer in writing, setting forth the basis for his determination. Within 30 days following receipt of the notification, the manufacturer may request a hearing on the Administrator's determination. The request shall be in writing, signed by an authorized representative of the manufacturer and shall include a statement specifying the manufacturer's objections to the Administrator's determination and data in support of such objections. If, after a review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 86.077-6 with respect to such issue.

(4) The manufacturer may, at his option, proceed with any of the following alternatives with respect to any engine family represented by a test vehicle(s) (or test engine(s)) determined not in compliance with applicable standards.

(i) Request a hearing under § 86.077-6; or

(ii) Delete from the application for certification the vehicles (or engines) represented by the failing test vehicle (or failing test engine). (Vehicles or engines so deleted may be included in a later request for certification under § 86.077-32.) The Administrator will then select in place of each failing vehicle (or failing engine) an alternate vehicle (or alternate engine) chosen in accordance with selection criteria employed in selecting the vehicle (or engine) that failed; or

(iii) Modify the test vehicle (or test engine) and demonstrate by testing that it meets applicable standards. Another vehicle (or engine) which is in all material respects the same as the first vehicle (or engine) as modified, shall then be operated and tested in accordance with applicable test procedures.

(5) If the manufacturer does not request a hearing or present the required data under paragraph (b)(4) of this section, the Administrator will deny certification.

(c)(1) Notwithstanding the fact that any certification vehicle(s) (or certification engine(s)) may comply with other provisions of this subpart, the Administrator may withhold or deny the issuance of a certificate of conformity (or suspend or revoke any such certificate which has been issued) with respect to any such vehicle(s) (or engine(s)) if:

(i) The manufacturer submits false or incomplete information in his application for certification thereof;

(ii) The manufacturer renders inaccurate any test data which he submits pertaining thereto.

(iii) Any EPA Enforcement Officer is denied access on the terms specified in § 86.077-7(c) to any facility or portion thereof which contains any of the following:

(A) The vehicle (or engine);

(B) Any components used or considered for use in its modification or build up into a certification vehicle (or certification engine);

(C) Any production vehicle (or production engine) which is or will be claimed by the manufacturer to be covered by the certificate;

(D) Any step in the construction of a vehicle (or engine) described in (C) of this subdivision;

(E) Any records, documents, reports, or histories required by this part to be kept concerning any of the above.

(iv) Any EPA Enforcement Officer is denied "reasonable assistance" (as defined in § 86.077-7(c)) in examining any of the items listed in paragraph (c)(1)(iii) of this section.

(2) The sanctions of withholding, denying, revoking, or suspending of a certificate may be imposed for the reasons in paragraphs (c)(1)(i), (ii), (iii), or (iv) of this section only when the infraction is substantial.

(3) In any case in which a manufacturer knowingly submits false or inaccurate information or knowingly renders inaccurate or invalid any test data or commits any other fraudulent acts and such acts contribute substantially to the Administrator's decision to issue a certificate of conformity, the Administrator may deem such certificate void ab initio.

(4) In any case in which certification of a vehicle (or engine) is proposed to

be withheld, denied, revoked, or suspended under paragraph (c)(1)(iii), or (c)(1)(iv) of this section, and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.077-7(c) in fact occurred, the manufacturer, if he wishes to contend that, even though the violation occurred, the vehicle (or engine) in question was not involved in the violation to a degree that would warrant withholding denial, revocation, or suspension of certification under either paragraph (c)(1)(iii) or (c)(1)(iv) of this section, shall have the burden of establishing that contention to the satisfaction of the Administrator.

(5) Any revocation or suspension of certification under paragraph (c)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.077-6 hereof.

(ii) Extend no further than to forbid the introduction into commerce of vehicles (or engines) previously covered by certification which are still in the hands of the manufacturer, except in cases of such fraud or other misconduct as makes certification invalid ab initio.

(6) The manufacturer may request in the form and manner specified in paragraph (b)(3) of this section that any determination made by the Administrator under paragraph (c)(1) of this section to withhold or deny certification be reviewed in a hearing conducted in accordance with § 86.077-6. If the Administrator finds, after a review of the request and supporting data, that the request raises a substantial factual issue he will grant the request with respect to such issue.

(d)(1) *For light-duty vehicles and light-duty trucks.* Notwithstanding the fact that any vehicle configuration or engine family may be covered by a valid outstanding certificate of conformity, the Administrator may suspend such outstanding certificate of conformity in whole or in part with respect to such vehicle configuration or engine family if:

(i) The manufacturer refuses to comply with the provisions of a test order issued by the Administrator pursuant to § 86.603; or

(ii) The manufacturer refuses to comply with any of the requirements of § 86.603; or

(iii) The manufacturer submits false or incomplete information in any report or information provided pursuant to the requirements of § 86.609; or

(iv) The manufacturer renders inaccurate any test data which he submits pursuant to § 86.609; or

(v) Any EPA Enforcement Officer is denied access to a facility on the terms specified in § 86.606.

(vi) Any EPA Enforcement Officer is denied the opportunity on the terms specified in § 86.606 to

(A) Monitor vehicle selection pursuant to § 86.607,

(B) Select vehicles for testing pursuant to § 86.607, or

(C) Monitor vehicle testing performed to satisfy any of the requirements of this part; or

(vii) Any EPA Enforcement Officer is denied "reasonable assistance" as defined in § 86.606 in examining any of the items listed in that section; or

(viii) The manufacturer refuses to comply with the requirements of §§ 86.604(a), 86.605, 86.607, 86.608, 86.610, or 86.611.

(2) The sanction of suspending a certificate may not be imposed for the reasons in paragraphs (d)(1)(i), (ii) or (viii) of this section where such refusal is caused by conditions and circumstances outside the control of the manufacturer which renders it impossible to comply with those requirements. Such conditions and circumstances shall include, but are not limited to, any uncontrollable factors which result in the temporary unavailability of equipment and personnel needed to conduct the required tests, such as equipment breakdown or failure or illness of personnel, but shall not include failure of the manufacturer to adequately plan for and provide the equipment and personnel needed to conduct the tests. The manufacturer will bear the burden of establishing the presence of the conditions and circumstances required by this paragraph.

(3) The sanctions of suspending a certificate may be imposed for the reasons in paragraphs (d)(1)(iii), (iv), (v), (vi), (vii) of this section only when the infraction is substantial.

(4) In any case in which a manufacturer knowingly submitted false or inaccurate information or knowingly rendered inaccurate any test data or committed any other fraudulent acts, and such acts contributed substantially to the Administrator's original decision not to suspend or revoke a certificate of conformity in whole or in part, the Administrator may deem such certificate void from the date of such fraudulent act.

(5) In any case in which certification of a vehicle is proposed to be suspended under paragraph (d)(1)(v), (d)(1)(vi), or (d)(1)(vii) of this section, and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.606 in fact occurred, the manufacturer, if he wishes to contend that, even though the violation occurred, the vehicle configuration or engine family in question was not involved in the violation to a degree that would warrant suspension of certification under either paragraph (d)(1)(v), (d)(1)(vi), or (d)(1)(vii) of this section, shall have the burden of establishing that contention to the satisfaction of the Administrator.

(6) Any suspension of certification under paragraph (d)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.613 hereof and

(ii) Not apply to vehicles no longer in the hands of the manufacturer.

§ 86.077-31 Separate certification.

Where possible a manufacturer should include in a single application for certification all vehicles (or engines) for which certification is required. A manufacturer may, however, choose to apply separately for certification of part of his product line. The selection of test vehicles (or test engines) and the computation of test results will be determined separately for each application.

§ 86.077-32 Addition of a vehicle or engine after certification.

(a) If a manufacturer proposes to add to his product line a vehicle (or engine) of the same engine-system combination as vehicles (or engines) previously certified but which was not described in the application for certification when the test vehicle(s) (or test engine(s)) representing other vehicles (or engines) of that combination was certified, he shall notify the Administrator. Such notification shall be in advance of the addition unless the manufacturer elects to follow the procedure described in § 86.077-34. This notification shall include a full description of the vehicle (or engine) to be added.

(b) The Administrator may require the manufacturer to perform such tests on the test vehicle(s) (or test engine(s)) representing the vehicle (or engine) to be added which would have been required if the vehicle (or engine) had been included in the original application for certification.

(c) If, after a review of the test reports and data submitted by the manufacturer, and data derived from any testing conducted under § 86.077-29, the Administrator determines that the test vehicle(s) or test engine(s) meets all applicable standards, the appropriate certificate will be amended accordingly. If the Administrator determines that the test vehicle(s) (or test engine(s)) does not meet applicable standards, he will proceed under § 86.077-30(b).

§ 86.077-33 Changes to a vehicle or engine covered by certification.

(a) The manufacturer shall notify the Administrator of any change in production vehicles (or production engines) in respect to any of the parameters listed in § 86.077-24(a)(3), § 86.077-24(b)(1)(iii), § 86.077-24(b)(2)(iii), or § 86.077-24(b)(3)(iii) as applicable, giving a full description of the change. Such notification shall be in advance of the change unless the manufacturer elects to follow the procedure described in § 86.077-34.

(b) Based upon the description of the change and data derived from such testing as the Administrator may require or conduct, the Administrator will determine whether the vehicle (or engine), as modified, would still be covered by the certificate of conformity then in effect.

(c) If the Administrator determines that the outstanding certificate would cover the modified vehicles (or engines) he will notify the manufacturer in writing. Except as provided in § 86.077-34, the change may not be put into effect prior to the manufacturer's receiving this noti-

fication. If the Administrator determines that the modified vehicles (or engines) would not be covered by the certificate then in effect, the modified vehicles (or engines) shall be treated as additions to the product line subject to § 86.077–32.

§ 86.077–34 Alternative procedure for notification of additions and changes.

(a) A manufacturer may, in lieu of notifying the Administrator in advance of an addition of a vehicle (or engine) under § 86.077–32 or a change in a vehicle (or engine) under § 86.077–33, notify him concurrently with the making of the change if the manufacturer believes the addition or change will not require any testing under the appropriate section. Upon notification to the Administrator, the manufacturer may proceed to put the addition or change into effect.

(b) The manufacturer may continue to produce vehicles (or engines) as described in the notification to the Administrator for a maximum of 30 days, unless the Administrator grants an extension in writing. This period may be shortened by a notification in accordance with paragraph (c) of this section.

(c) If the Administrator determines, based upon a description of the addition or change, that no test data will be required, he will notify the manufacturer in writing of the acceptability of the addition or change. If the Administrator determines that test data will be required, he will notify the manufacturer to rescind the change within 5 days of receipt of the notification. The Administrator will then proceed as in § 86.077–32 (b) and (c), or § 86.077–33 (b) and (c) as appropriate.

(d) Election to produce vehicles (or engines) under this section will be deemed to be a consent to recall all vehicles (or engines) which the Administrator determines under § 86.077–32(c) do not meet applicable standards, and to cause such nonconformity to be remedied at no expense to the owner.

§ 86.077–35 Labeling.

(a) The manufacturer of any motor vehicle (or motor vehicle engine) subject to the applicable emission standards of this subpart, shall at the time of manufacture, affix a permanent, legible label, of the type and in the manner described below, containing the information hereinafter provided, to all production models of such vehicles (or engines) available for sale to the public and covered by a certificate of conformity under § 86.077–30(a).

(1) *Light-duty vehicles and light-duty trucks.* (i) A legible, permanent label shall be affixed in a readily visible position in the engine compartment.

(ii) The label shall be affixed by the vehicle manufacturer who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label. The label shall not be affixed to any equipment which is easily detached from such vehicle.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals, which shall be of a color that contrasts with the background of the label:

(A) The label heading: Vehicle Emission Control Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine displacement (in cubic inches) and engine family identification;

(D) Engine tuneup specifications and adjustments, as recommended by the manufacturer in accordance with the altitude at which the vehicle is to be sold to the ultimate purchaser, including but not limited to idle speed(s), ignition timing, the idle air-fuel mixture setting procedure and value (e.g., idle CO, idle air-fuel ratio, idle speed drop), high idle speed, initial injection timing, and valve lash (as applicable) as well as other parameters deemed necessary by the manufacturer. These specifications should indicate the proper transmission position during tuneup and what accessories (e.g., air conditioner), if any, should be in operation;

(E) An unconditional statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations which apply to light-duty vehicles or light-duty trucks.

(F) The altitude at which the vehicle is intended for sale to the public as specified by a certificate of conformity under § 86.077–30.

(2) *Gasoline-fueled heavy-duty engines.* (i) A legible, permanent label shall be affixed to the engine in a position in which it will be readily visible after installation in the vehicle.

(ii) The label shall be attached to an engine part necessary for normal engine operation and not normally requiring replacement during engine life.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals which shall be of a color that contrasts with the background of the label:

(A) The label heading: Engine Exhaust Emission Control Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine displacement (in cubic inches) and engine family identification;

(D) Date of engine manufacture (month and year);

(E) Engine tuneup specifications and adjustments as recommended by the manufacturer, including idle speed, ignition timing, and the idle air-fuel mixture setting procedure and value (e.g., idle CO, idle air-fuel ratio, idle speed drop), and valve lash. These specifications should indicate the proper transmission position during tuneup and what accessories (e.g., air conditioner), if any, should be in operation;

(F) An unconditional statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations applicable to gasoline-fueled heavy-duty engines.

(iv) The label may be made up of one or more pieces provided that all pieces are permanently attached to the same engine part.

(3) *Diesel heavy-duty engines.* (i) A legible, permanent label shall be affixed to the engine in a position in which it will be readily visible after installation in the vehicle.

(ii) The label shall be attached to an engine part necessary for normal engine operation and not normally requiring replacement during engine life.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals which shall be of a color that contrasts with the background of the label:

(A) The label heading: Engine Exhaust Emission Control Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine family identification and model;

(D) Date of engine manufacture (month and year);

(E) Engine specification:

Advertised hp. ____ at ____ r.p.m.
Fuel rate at advertised hp. ____ mm³/stroke.
Valve lash ____ (inches).
Initial injection timing (if adjustable) ____.
(The information applicable to each engine is to be inserted on the appropriate line.)

(F) An unconditional statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations applicable to Diesel heavy-duty engines.

(iv) The label may be made up of one or more pieces provided that all pieces are permanently attached to the same engine or vehicle part as applicable.

(b) The provisions of this section shall not prevent a manufacturer from also reciting on the label that such vehicle (or engine) conforms to any applicable state emission standards for new motor vehicles (or new motor vehicle engines) or any other information that such manufacturer deems necessary for, or useful to, the proper operation and satisfactory maintenance of the vehicle (or engine).

(c) (1) The manufacturer of any light-duty vehicle or light-duty truck subject to the emission standards of this subpart shall, in addition, and subsequent to setting forth those statements on the label required by the Department of Transportation (DOT) pursuant to 49 CFR 567.4, set forth on the DOT label or on an additional label located in proximity to the DOT label and affixed as described in 49 CFR 567.4(b) the following information in the English language, lettered in block letters and numerals not less than three thirty-seconds of an inch high, of a color that contrasts with the background of the label:

(i) The Heading: "Vehicle Emission Control Information"

(ii) The Statement: "This Vehicle Conforms to U.S. EPA Regulations Applicable to 1977 Model Year New Motor Vehicles"

(iii) One of the following statements, as applicable, in letters and numerals not less than six thirty-seconds of an inch high and of a color that contrasts with the background of the label:

(A) For all vehicles certified as non-catalyst-equipped: "NON-CATALYST"

(B) For all vehicles certified as catalyst-equipped which are included in a manufacturer's catalyst control program

for which approval has been given by the Administrator: "CATALYST—APPROVED FOR IMPORT"

(C) For all vehicles certified as catalyst-equipped which are not included in a manufacturer's catalyst control program for which prior approval has been given by the Administrator: "CATALYST"

(2) In lieu of selecting either of the labeling options of paragraph (c)(1) of this section, the manufacturer may add the information required by paragraph (c)(1)(iii) of this section to the label required by paragraph (a) of this section. The required information will be set forth in the manner prescribed by paragraph (c)(1)(iii).

§ 86.077–36 Submission of vehicle identification numbers.

(a) The manufacturer of any light-duty vehicle or light-duty truck covered by a certificate of conformity under § 86.077–30(a) shall, not later than 60 days after its manufacture, submit to the Administrator the vehicle identification number of such vehicle: *Provided*, That this requirement shall not apply with respect to any vehicle manufactured within any State, as defined in section 302(d) of the Act.

(b) The requirements of this section may be waived with respect to any manufacturer who provides information satisfactory to the Administrator which will enable the Administrator to identify those vehicles which are covered by a certificate of conformity.

§ 86.077–37 Production vehicles and engines.

(a) Any manufacturer obtaining certification under this part shall supply to the Administrator, upon his request, a reasonable number of production vehicles (or engines) selected by the Administrator which are representative of the engines, emission control systems, fuel systems, and transmissions offered and typical of production models available for sale under the certificate. These vehicles (or engines) shall be supplied for testing at such time and place and for such reasonable periods as the Administrator may require. Heavy-duty engines supplied under this paragraph may be required to be mounted in chassis and appropriately equipped for operation on a chassis dynamometer.

(b) *Light-duty vehicles and light-duty trucks.*

(1) Any light-duty vehicle or light-duty truck manufacturer obtaining certification under this part shall notify the Administrator, on a quarterly basis, of the number of vehicles of each engine family-engine displacement-exhaust emission control system-fuel system-transmission type-inertia weight class combination produced for sale in the United States during the preceding quarter. A manufacturer may elect to provide this information every 60 days instead of quarterly, to combine it with the notification required under § 86.077–36.

(2) All light-duty vehicles and light-duty trucks covered by a certificate of conformity under § 86.077–30(a) shall be adjusted by the manufacturer to the ignition or injection timing specification detailed in § 86.077–35(a)(1)(iii)(D).

(c) *Heavy-duty engines.* Any heavy-duty engine manufacturer obtaining certification under this part shall notify the Administrator, on a quarterly basis, of the number of engines of each engine family-engine displacement-exhaust emission control system-fuel system combination produced for sale in the United States during the preceding quarter.

§ 86.077–38 Maintenance instructions.

(a) The manufacturer shall furnish or cause to be furnished to the purchaser of each new motor vehicle (or motor vehicle engine) subject to the standards prescribed in §§ 86.077–8 through 86.077–11 as applicable, written instructions for the maintenance and use of the vehicle (or engine) by the purchaser as may be reasonable and necessary to assure the proper functioning of emission control systems.

(1) Such instructions shall be provided for those vehicle and engine components listed in Appendix VI to this part (and for any other components) to the extent that maintenance of these components is necessary to assure the proper functioning of emission control systems.

(2) Such instructions shall be in clear, and to the extent practicable, nontechnical language.

(b) The maintenance instructions required by this section shall contain a general description of the documentation which the manufacturer will require from the ultimate purchaser or any subsequent purchaser as evidence of compliance with the instructions.

(c) For gasoline-fueled light-duty vehicles and light-duty trucks.

(1) Such instructions shall specify the performance of all scheduled maintenance performed by the manufacturer under §§ 86.077–25(a)(2) or 86.077–25(b)(2) as applicable, and shall explain the conditions under which EGR system and catalytic converter maintenance is to be performed (e.g., what type of warning device is being employed and whether the device is activated by component failure or the need for periodic maintenance).

(2) Such instructions shall indicate, for vehicles to be sold to ultimate purchasers at low altitude, what adjustments or modifications, if any, are necessary to allow the vehicle to meet emissions standards at high altitude. The maintenance instructions shall, if applicable, include a statement that the vehicle's emission control system was not designed for conversion to allow the vehicle to meet emissions standards when operated at high altitude.

(3) Such instructions shall indicate, for vehicles to be sold to ultimate purchasers at high altitude, what adjustments or modifications, if any, are necessary to allow the vehicle to meet emissions standards at low altitude. The maintenance instructions shall, if applicable, include a statement that the vehicle's emission control system was not designed for conversion to allow the vehicle to meet emissions standards when operated at low altitude.

(d) For Diesel light-duty vehicles and light-duty trucks.

(1) Such instructions shall indicate, for vehicles to be sold to ultimate purchasers at low altitude, what adjustments or modifications, if any, are necessary to allow the vehicle to meet emissions standards at high altitude. The maintenance instructions shall, if applicable, include a statement that the vehicle's emission control system was not designed for conversion to allow the vehicle to meet emissions standards when operated at high altitude.

(2) Such instructions shall indicate, for vehicles to be sold to ultimate purchasers at high altitude, what adjustments or modifications, if any, are necessary to allow the vehicle to meet emissions standards at low altitude. The maintenance instructions shall, if applicable, include a statement that the vehicle's emission control system was not designed for conversion to allow the vehicle to meet emissions standards when operated at low altitude.

(e) For gasoline-fueled heavy-duty engines, such instructions shall specify the performance of all scheduled maintenance performed by the manufacturer under § 86.077–25(c)(2). Scheduled maintenance in addition to that performed on the durability-data engine under § 86.077–25(d)(2) may be recommended for reasons such as to offset the effects of operating conditions which differ from the dynamometer durability cycle or to increase the life of the engine beyond 1500 hours (or the equivalent). The instructions may schedule maintenance on a calendar time basis and/or mileage basis in addition to the engine service time basis that was followed by the manufacturer under § 86.077–25(c)(2).

(f) For Diesel heavy-duty engines, such instructions shall specify the performance of all scheduled maintenance performed by the manufacturer under § 86.077–25(d)(2). Scheduled maintenance in addition to that performed on the durability-data engine under § 86.077–25(d)(2) may be recommended for reasons such as to offset the effects of operating conditions which differ from the dynamometer durability cycle or to increase the life of the engine beyond 1,000 hours (or the equivalent). The instructions may schedule maintenance on a calendar time basis, mileage basis, engine service time basis, or combinations of each.

§ 86.077–39 Submission of maintenance instructions.

(a) The manufacturer shall provide to the Administrator, no later than the time of the submission required by § 86.077–23, a copy of the maintenance instructions which the manufacturer proposes to supply to the ultimate purchaser in accordance with § 86.077–38(a). The Adminis-

trator will review such instructions to determine whether they are reasonable and necessary to assure the proper functioning of the vehicle's (or engine's) emission control systems. The Administrator will notify the manufacturer of his determination whether such instructions are reasonable and necessary to assure the proper functioning of the emission control systems.

(b) Any revision to the maintenance instructions which will affect emissions shall be supplied to the Administrator at least 30 days before being supplied to the ultimate purchaser unless the Administrator consents to a lesser period of time.

§ 86.078–1 General applicability.

(a) The provisions of this subpart apply to 1978 model year new gasoline-fueled and Diesel light-duty vehicles, 1978 model year new gasoline-fueled and Diesel light-duty trucks and 1978 model year new gasoline-fueled and Diesel heavy-duty engines.

(b) Optional applicability. A manufacturer may request to certify any heavy-duty vehicle 10,000 pounds GVWR or less as a light-duty truck; heavy-duty vehicle provisions do not apply to such a vehicle. Provisions applicable for the 1979 model year shall be followed with respect to such vehicles;, however, the standards in § 86.078–9 shall apply. Any 1978 model year light-duty truck may be certified under the provisions applicable for the 1979 model year except that the standards in § 86.078–9 still apply.

§ 86.078–2 Definitions.

The following definitions apply beginning with the 1978 model year. Section 86.077–2 remains effective excepting those definitions which are hereby superseded.

"Accuracy" means the difference between a measurement and true value.

"Basic engine" means a unique combination of manufacturer, engine displacement, number of cylinders, fuel system (as distinguished by number of carburetor barrels or use of fuel injection), catalyst usage, and other engine and emission control system characteristics specified by the Administrator.

"Body type" means a name denoting a group of vehicles that are either in the same car line or in different car lines provided the only reason the vehicles qualify to be considered in different car lines is that they are produced by separate divisions of a single manufacturer.

"Calibration" means the set of specifications, including tolerances, unique to a particular design, version, or application of a component or components assembly capable of functionally describing its operation over its working range.

"Car line" means a name denoting a group of vehicles within a make or car division which has a degree of commonality in construction (e.g., body, chassis). Car line does not consider any level of decor or opulence and is not generally distinguished by characteristics as roof line, number of doors, seats or windows except for station wagons or light-duty trucks. Station wagons and light-duty trucks are considered to be different car lines than passenger cars.

"Diurnal breathing losses" means evaporative emissions as a result of the daily range in temperature.

"Engine code" means a unique combination, within an engine-system combination, of displacement, carburetor (or fuel injection) calibration, choke calibration, distributor calibration, auxiliary emission control devices and other engine and emission control system components specified by the Administrator.

"Engine—system combination" means an engine family-exhaust emission control system combination.

"Evaporative emission code" means a unique combination in an evaporative emission family—evaporative emission control system combination, of purge system calibrations, fuel tank and carburetor bowl vent calibrations and other fuel system and evaporative emission control system components and calibrations specified by the Administrator.

"Evaporative emissions" means hydrocarbons emitted into the atmosphere from a motor vehicle, other than exhaust and crankcase emissions.

"Evaporative vehicle configuration" means a unique combination of basic engine, engine code, body type, and evaporative emission code.

"Fuel system" means the combination of fuel tank(s), fuel pump, fuel lines, and carburetor or fuel injection components, and includes all fuel system vents and fuel evaporative emission control system components.

"Hot-soak losses" means evaporative emissions after termination of engine operation.

"Malfunction" means not operating according to specifications (e.g., those specifications listed in the application for certification).

"Model type" means a unique combination of car line, basic engine, and transmission class.

"Nominal fuel tank capacity" means the volume of the fuel tank(s), specified by the manufacturer to the nearest tenth of a U.S. gallon, which may be filled with fuel from the fuel tank filler inlet.

"Precision" means the standard deviation of replicated measurements.

"Tank fuel volume" means the volume of fuel in the fuel tank(s), which is determined by taking the manufacturer's nominal fuel tank(s) capacity and multiplying by 0.40, the result being rounded using ASTM E 29–67 to the nearest tenth of a U.S. gallon.

"Transmission class" means the basic type of transmission, e.g., manual, automatic, semi-automatic.

"Transmission configuration" means a unique combination, within a transmission class, of the number of the forward gears and, if applicable, overdrive. The Administrator may further subdivide a transmission configuration (based on such criteria as gear ratios, torque convertor multiplication ratio, stall speed and shift calibration, etc.), if he determines that significant fuel economy or exhaust emission differences exist within that transmission configuration.

"Vehicle configuration" means a unique combination of basic engine, engine code, inertia weight, transmission configuration, axle ratio.

"Zero (0) miles" means that point after initial engine starting (not to exceed 10 miles of vehicle operation, or one hour of engine operation) at which normal assembly line operations and adjustments are completed.

§ 86.078–3 Abbreviations.

(a) The abbreviations in this section apply to this subpart and also to Subparts B, H, I, and J and have the following meanings:

accel.—acceleration.
AECD—Auxiliary emission control device.
API—American Petroleum Institute.
ASTM—American Society for Testing and Materials.
BHP—Brake horsepower.
BSCO—Brake specific carbon monoxide.
BSHC—Brake specific hydrocarbons.
$BSNO_x$—Brake specific oxides of nitrogen.
C—Celsius.
cfh—cubic feet per hour.
CFV—Critical flow venturi.
CFV–CVS—Critical flow venturi—constant volume sampler.
CL—Chemiluminescence.
CO_2—carbon dioxide.
CO—Carbon monoxide.
conc.—concentration.
cfm—cubic feet per minute.
CT—Closed throttle.
cu. in.—cubic inch(es).
CVS—Constant volume sampler.
decel.—deceleration.
EP—End point.
evap.—evaporative.
F—Fahrenheit.
FID—Flame ionization detector.
FL—Full load.
ft.—feet.
g—gram(s).
gal.—U.S. gallon(s).
GVW—Gross vehicle weight.
GVWR—Gross vehicle weight rating.
h—hour(s).
H_2O—water.
HC—hydrocarbon(s).
HFID—Heated flame ionization detector.
Hg—mercury.
hi—high.
hp.—horsepower.
IBP—Initial boiling point.
ID—Internal diameter.
in.—inch(es).
K—kelvin.
kg—kilogram(s).
km—kilometer(s).
kPa—kilopascal(s).
lb.—pound(s).
lb.-ft.—pound-feet.
m—meter(s).
max.—maximum.
mg—milligram(s).
mi.—mile(s).
min.—minute(s).
ml—milliliter(s).
mm—millimeter(s).
mph—miles per hour.
mv—millivolt(s).
N_2—nitrogen.
NDIR—Nondispersive infrared.
NO—nitric oxide.
NO_2—nitrogen dioxide.
NO_x—oxides of nitrogen.
No.—Number.
O_2—oxygen.
Pb—lead.
pct.—percent.
PDP–CVS—Positive displacement pump—constant volume sampler.
ppm—parts per million by volume.

ppm C—parts per million, carbon.
psi—pounds per square inch.
psig—pounds per square inch gauge.
PTA—Part throttle acceleration.
PTD—Part throttle deceleration.
R—Rankin.
rpm—revolutions per minute.
RVP—Reid vapor pressure.
s—second(s).
SAE—Society of Automotive Engineers.
SI—International system of units.
sp.—speed.
TEL—Tetraethyl lead.
TML—Tetramethyl lead.
UDDS—Urban dynamometer driving schedule.
V—volt(s).
vs—versus.
W—watt(s).
WF—Weighting factor.
WOT—Wide open throttle.
wt.—weight.
'—feet.
''—inch(es).
°—degree(s).
Σ—summation.

§ 86.078–4 Section numbering; construction.

(a) *Section numbering.* The model year of initial applicability is indicated by the last two digits of the 5 digit group. A section remains in effect for subsequent model years until it is superseded. The number following the hyphen designates what previous section is replaced by a future regulation.

EXAMPLES: Section 86.077–6 applies to the 1977 and subsequent model years until superseded. If a § 86.080–6 is promulgated it would take effect with the 1980 model year; § 86.077–6 would not apply after the 1979 model year. Section 86.077–10 would be replaced by § 86.078–10 beginning with the 1978 model year.

(b) *Construction.* Except where indicated, the language in this subpart applies to both vehicles and engines. In many instances language referring to engines is enclosed in parentheses and immediately follows the language discussing vehicles.

§ 86.078–5 General standards; increase in emissions; unsafe conditions.

(a)(1) Every new motor vehicle (or new motor vehicle engine) manufactured for sale, sold, offered for sale, introduced, or delivered for introduction into commerce, or imported into the United States for sale or resale which is subject to any of the standards prescribed in this subpart shall be covered by a certificate of conformity issued pursuant to §§ 86.078–21 through 86.078–23 and §§ 86.078–29 through 86.078–34.

(2) No heavy-duty vehicle manufacturer shall take any of the actions specified in section 203(a)(1) of the Act with respect to any gasoline-fueled or Diesel heavy-duty vehicle which uses an engine which has not been certified as meeting applicable standards. Each heavy-duty vehicle manufacturer shall provide to the Administrator prior to the beginning of each model year a statement signed by an authorized representative which includes the following information:

(i) A description of the vehicles which will be produced subject to this section;

(ii) Identification of the engines used in the vehicles;

(iii) Projected sales data on each vehicle-engine combination;

(iv) A statement that the engines will not be modified by the vehicle manufacturer or a detailed specification of any changes which will be made. Changes mode solely for the purpose of mounting an engine in a vehicle need not be included.

(v) A statement that the engine maintenance instructions supplied by the engine manufacturer, in compliance with § 86.078–38, will be furnished to the ultimate purchaser. If these maintenance instructions are modified, a detailed description of the modifications and a justification for each must be provided to the Administrator for review. The Administrator will notify the manufacturer of the determination whether the modified instructions are reasonable and necessary to assure proper functioning of the emission control system.

(b)(1) Any system installed on or incorporated in a new motor vehicle (or new motor vehicle engine) to enable such vehicle (or engine) to conform to standards imposed by this subpart:

(i) Shall not in its operation or function cause the emission into the ambient air of any noxious or toxic substance that would not be emitted in the operation of such vehicle (or engine) without such system, except as specifically permitted by regulation; and

(ii) Shall not in its operation, function, or malfunction result in any unsafe condition endangering the motor vehicle, its occupants, or persons or property in close proximity to the vehicle.

(2) Every manufacturer of new motor vehicles (or new motor vehicle engines) subject to any of the standards imposed by this subpart shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicles (or motor vehicle engines) in accordance with good engineering practice to ascertain that such test vehicles (or test engines) will meet the requirements of this section for the useful life of the vehicle (or engine).

§ 86.078–6 Hearings on certification.

(a)(1) After granting a request for a hearing under §§ 86.078–22 or 86.078–30 the Administrator will designate a Presiding Officer for the hearing.

(2) The General Counsel will represent the Environmental Protection Agency in any hearing under this section.

(3) If a time and place for the hearing has not been fixed by the Administrator under §§ 86.078–22 or 86.078–30, the hearing shall be held as soon as practicable at a time and place fixed by the Administrator or by the Presiding Officer.

(4) In the case of any hearing requested pursuant to § 86.078–30(c)(5)(i), the Administrator may in his discretion direct that all argument and presentation of evidence be concluded within such fixed period not less than 30 days as he may establish from the date that the first written offer of a hearing is made to the manufacturer. To expedite proceedings, the Administrator may direct that the decision of the Presiding Officer (who may, but need not be the Administrator himself) shall be the final EPA decision.

(b)(1) Upon his appointment pursuant to paragraph (a) of this section, the Presiding Officer will establish a hearing file. The file shall consist of the notice issued by the Administrator under §§ 86.078–22 or 86.078–30 together with any accompanying material, the request for a hearing and the supporting data submitted therewith, and all documents relating to the request for certification and all documents submitted therewith, and correspondence and other data material to the hearing.

(2) The hearing file will be available for inspection by the applicant at the office of the Presiding Officer.

(c) An applicant may appear in person, or may be represented by counsel or by any other duly authorized representative.

(d)(1) The Presiding Officer upon the request of any party, or in his discretion, may arrange for a prehearing conference at a time and place specified by him to consider the following:

(i) Simplification of the issues;

(ii) Stipulations, admissions of fact, and the introduction of documents;

(iii) Limitation of the number of expert witnesses;

(iv) Possibility of agreement disposing of all or any of the issues in dispute;

(v) Such other matters as may aid in the disposition of the hearing, including such additional tests as may be agreed upon by the parties.

(2) The results of the conference shall be reduced to writing by the Presiding Officer and made part of the record.

(e)(1) Hearings shall be conducted by the Presiding Officer in an informal but orderly and expeditious manner. The parties may offer oral or written evidence, subject to the exclusion by the Presiding Officer of irrelevant, immaterial and repetitious evidence.

(2) Witnesses will not be required to testify under oath. However, the Presiding Officer shall call to the attention of witnesses that their statements may be subject to the provisions of title 18 U.S.C. 1001 which imposes penalties for knowingly making false statements or representations, or using false documents in any matter within the jurisdiction of any department or agency of the United States.

(3) Any witness may be examined or cross-examined by the Presiding Officer, the parties, or their representatives.

(4) Hearings shall be reported verbatim. Copies of transcripts of proceedings may be purchased by the applicant from the reporter.

(5) All written statements, charts, tabulations, and similar data offered in evidence at the hearings shall, upon a showing satisfactory to the Presiding Officer of their authenticity, relevancy, and materiality, be received in evidence and shall constitute a part of the record.

(6) Oral argument may be permitted in the discretion of the Presiding Offi-

cer and shall be reported as part of the record unless otherwise ordered by him.

(f) (1) The Presiding Officer shall make an initial decision which shall include written findings and conclusions and the reasons or basis therefor on all the material issues of fact, law, or discretion presented on the record. The findings, conclusions, and written decision shall be provided to the parties and made a part of the record. The initial decision shall become the decision of the Administrator without further proceedings unless there is an appeal to the Administrator or motion for review by the Administrator within 20 days of the date the initial decision was filed.

(2) On appeal from or review of the initial decision the Administrator shall have all the powers which he would have in making the initial decision including the discretion to require or allow briefs, oral argument, the taking of additional evidence or the remanding to the Presiding Officer for additional proceedings. The decision by the Administrator shall include written findings and conclusions and the reasons or basis therefor on all the material issues of fact, law, or discretion presented on the appeal or considered in the review.

§ 86.078–7 Maintenance of records; submittal of information; right of entry.

(a) The manufacturer of any new motor vehicle (or new motor vehicle engine) subject to any of the standards or procedures prescribed in this subpart shall establish, maintain and retain the following adequately organized and indexed records.

(1) *General records.* (i) The records required to be maintained by this paragraph shall consist of:

(A) Identification and description of all certification vehicles (or certification engines) for which testing is required under this subpart.

(B) A description of all emission control systems which are installed on or incorporated in each certification vehicle (or certification engine).

(C) A description of all procedures used to test each such certification vehicle (or certification engine).

(ii) A properly filed application for certification, following the format prescribed by the US EPA for the appropriate model year, fulfills each of the requirements of this paragraph (a)(1).

(2) *Individual records.* (i) A brief history of each motor vehicle (or motor vehicle engine) used for certification under this subpart in the form of a separate booklet or other document for each separate vehicle (or each separate engine) in which shall be recorded:

(A) In the case where a current production engine is modified for use in a certification vehicle (or as a certification engine), a description of the process by which the engine was selected and of the modifications made, giving specifically the place of modification and installation of the engine into the certification vehicle and the person(s) in charge of modification and installation, as applicable. In the case where the engine for a certification vehicle (or certification engine) is not derived from a current production engine, a general description of the build up of the engine (e.g., experimental heads were cast and machined according to supplied drawings, etc.) giving specifically the place of engine assembly and installation into a certification vehicle and the person(s) in charge of engine assembly and installation, as applicable. In both cases above, a description of the origin and selection process for the carburetor, distributor, fuel system components, fuel injection components, emission control system components, smoke exhaust emission control system components, and exhaust aftertreatment devices as applicable, shall be included. The required descriptions shall specify the steps taken to assure that the certification vehicle (or certification engine) with respect to its engine, drive train, fuel system, emission control system components, exhaust aftertreatment devices, smoke exhaust emission control system components, vehicle weight or any other devices or components, as applicable, that can reasonably be expected to influence exhaust or evaporative emissions, as applicable, will be representative of production vehicles (or engines) and that either all components and/or vehicle (or engine) construction processes, component inspection and selection techniques, and assembly techniques employed in constructing such vehicles (or engines) are reasonably likely to be implemented for production vehicles (or engines) or that they are as closely analogous as practicable to planned construction and assembly processes.

(B) A complete record of all emission tests performed under Subparts B, H, I, and J, as applicable (except tests performed by EPA directly), including all individual worksheets and/or other documentation relating to each such test, or exact copies thereof, the date, time, purpose, and location of each test, the number of miles accumulated on the vehicle (or the number of hours accumulated on the engine), when the tests began and ended, and the names of supervisory personnel responsible for the conduct of the tests.

(C) The date and times of each mileage (or service) accumulation run, listing both the mileage (or number of operating hours) accumulated and the name of each driver or each operator of the automatic mileage accumulation device (or dynamometer operator).

(D) If used, the record of any devices employed to record the speed and/or mileage in relationship to time of the test vehicle (or engine RPM, and/or horsepower and/or torque in relationship to engine operating time).

(E) A record and description of all maintenance and other servicing performed, giving the date and time of the maintenance or service, the reason for it, the person authorizing it, and the names of supervisory personnel responsible for the conduct of the maintenance or service. The description shall indicate whether or not EPA specifically consented to the work and, if EPA did not, shall list the provision of this part which authorizes its performance.

(F) A record and description of each test performed to diagnose engine or emissions control system performance, giving the date and time of the test, the reason for it, the person authorizing it, and the names of supervisory personnel responsible for the conduct of the test.

(G) The dates and times that the vehicle (or engine) was idle in storage, and in transit or transport.

(H) A brief description of any significant events affecting the vehicle (or engine) during any time in the period covered by the history not described by an entry under one of the previous headings including such extraordinary events as vehicle accidents (or accidents involving the engine) or driver speeding citations or warnings (or dynamometer runaway).

(ii) Each such history shall be started on the date that the first of any of the selection or buildup activities in paragraph (a)(2)(i)(A) of this section occurred with respect to the certification vehicle (or engine), shall be updated each time the operational status of the vehicle (or engine) changes or additional work is done on it, and shall be kept in a designated location.

(3) All records required to be maintained under this subpart shall be retained by the manufacturer for a period of six (6) years after issuance of all certificates of conformity to which they relate. Records may be retained as hard copy or reduced to microfilm, punch cards, etc., depending on the record retention procedures of the manufacturer, *Provided*, That in every case all the information contained in the hard copy shall be retained.

(b) The manufacturer of any new motor vehicle (or new motor vehicle engine) subject to any of the standards prescribed in this subpart shall submit to the Administrator at the time of issuance by the manufacturer copies of all instructions or explanations regarding the use, repair, adjustment, maintenance, or testing of such vehicle (or engine) relevant to the control of crankcase, exhaust or evaporative emissions, as applicable, issued by the manufacturer for use by other manufacturers, assembly plants, distributors, dealers, and ultimate purchasers; *Provided*, That any material not translated into the English language need not be submitted unless specifically requested by the Administrator.

(c) (1) Any manufacturer who has applied for certification of a new motor vehicle (or new motor vehicle engine) subject to certification test under this subpart shall admit or cause to be admitted any EPA Enforcement Officer during operating hours on presentation of credentials to any of the following:

(i) Any facility where any such tests or any procedures or activities connected with such tests are or were performed.

(ii) Any facility where any new motor vehicle (or new motor vehicle engine)

which is being, was, or is to be tested is present.

(iii) Any facility where any construction process or assembly process used in the modification or build up of such a vehicle (or engine) into a certification vehicle (or certification engine) is taking place or has taken place.

(iv) Any facility where any record or other document relating to any of the above is located.

(2) Upon admission to any facility referred to in paragraph (c)(1) of this section, any EPA Enforcement Officer shall be allowed:

(i) To inspect and monitor any part or aspect of such procedures, activities, and testing facilities, including, but not limited to, monitoring vehicle (or engine) preconditioning, emissions tests and mileage (or service) accumulation, maintenance, and vehicle soak and storage procedures (or engine storage procedures), and to verify correlation or calibration of test equipment;

(ii) To inspect and make copies of any such records, designs, or other documents; and

(iii) To inspect and/or photograph any part or aspect of any such certification vehicle (or certification engine) and any components to be used in the construction thereof.

(3) In order to allow the Administrator to determine whether or not production motor vehicles (or production motor vehicle engines) conform in all material respects to the design specifications which applied to those vehicles (or engines) described in the application for certification for which a certificate of conformity has been issued to standards prescribed under section 202 of the Act, any manufacturer shall admit any EPA Enforcement Officer on presentation of credentials to both:

(i) Any facility where any document, design, or procedure relating to the translation of the design and construction of engines and emission related components described in the application for certification or used for certification testing into production vehicles (or production engines) is located or carried on; and

(ii) Any facility where any motor vehicles (or motor vehicle engines) to be introduced into commerce are manufactured or assembled.

(4) On admission to any such facility referred to in paragraph (c)(3) of this section, any EPA Enforcement Officer shall be allowed:

(i) To inspect and monitor any aspects of such manufacture or assembly and other procedures;

(ii) To inspect and make copies of any such records, documents or designs; and

(iii) To inspect and photograph any part or aspect of any such new motor vehicles (or new motor vehicle engines) and any component used in the assembly thereof that are reasonably related to the purpose of his entry.

(5) Any EPA Enforcement Officer shall be furnished by those in charge of a facility being inspected with such reasonable assistance as he may request to help him discharge any function listed in this paragraph. Each applicant for or recipient of certification is required to cause those in charge of a facility operated for its benefit to furnish such reasonable assistance without charge to EPA whether or not the applicant controls the facility.

(6) The duty to admit or cause to be admitted any EPA Enforcement Officer applies whether or not the applicant owns or controls the facility in question and applies both to domestic and to foreign manufacturers and facilities. EPA will not attempt to make any inspections which it has been informed that local law forbids. However, if local law makes it impossible to do what is necessary to insure the accuracy of data generated at a facility, no informed judgment that a vehicle or engine is certifiable or is covered by a certificate can properly be based on those data. It is the responsibility of the manufacturer to locate its testing and manufacturing facilities in jurisdictions where this situation will not arise.

(7) For purposes of this paragraph:

(i) "Presentation of credentials" shall mean display of the document designating a person as an EPA Enforcement Officer.

(ii) Where vehicle, component, or engine storage areas or facilities are concerned, "operating hours" shall mean all times during which personnel other than custodial personnel are at work in the vicinity of the area or facility and have access to it.

(iii) Where facilities or areas other than those covered by paragraph (c)(7)(ii) of this section are concerned, "operating hours" shall mean all times during which an assembly line is in operation or all times during which testing, maintenance, mileage (or service) accumulation, production or compilation of records, or any other procedure or activity related to certification testing, to translation of designs from the test stage to the production stage, or to vehicle (or engine) manufacture or assembly is being carried out in a facility.

(iv) "Reasonable assistance" includes, but is not limited to, clerical, copying, interpretation and translation services, the making available on request of personnel of the facility being inspected during their working hours to inform the EPA Enforcement Officer of how the facility operates and to answer his questions, and the performance on request of emissions tests on any vehicle (or engine) which is being, has been, or will be used for certification testing. Such tests shall be nondestructive, but may require appropriate mileage (or service) accumulation. A manufacturer may be compelled to cause the personal appearance of any employee at such a facility before an EPA Enforcement Officer by written request for his appearance, signed by the Assistant Administrator for Enforcement, served on the manufacturer. Any such employee who has been instructed by the manufacturer to appear will be entitled to be accompanied, represented, and advised by counsel.

(v) Any entry without 24 hour prior written or oral notification to the affected manufacturer shall be authorized in writing by the Assistant Administrator for Enforcement.

§ 86.078–8 Emission standards for 1978 light-duty vehicles.

(a)(1) Exhaust emissions from 1978 and later model year light-duty vehicles shall not exceed:

(i) *Hydrocarbons.* 0.41 grams per vehicle mile.

(ii) *Carbon monoxide.* 3.4 grams per vehicle mile.

(iii) *Oxides of nitrogen.* 0.4 grams per vehicle mile.

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over a driving schedule as set forth in Subpart B of this part and measured and calculated in accordance with those procedures.

(b)(1) Fuel evaporative emissions from 1978 and later model year gasoline-fueled light-duty vehicles shall not exceed:

(i) *Hydrocarbons.* 6.0 grams per test.

(2) The standard set forth in paragraph (b)(1) of this section refers to a composite sample of the fuel evaporative emissions collected under the conditions set forth in Subpart B of this part and measured in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any 1978 and later model year gasoline-fueled light-duty vehicle.

§ 86.078–9 Emission standards for 1978 light-duty trucks.

(a)(1) Exhaust emissions from 1978 model year light-duty trucks shall not exceed:

(i) *Hydrocarbons.* 2.0 grams per vehicle mile.

(ii) *Carbon monoxide.* 20 grams per vehicle mile.

(iii) *Oxides of nitrogen.* 3.1 grams per vehicle mile.

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over a driving schedule as set forth in Subpart B and measured and calculated in accordance with those procedures.

(b)(1) Evaporative emissions from 1978 and later model year gasoline-fueled light-duty trucks shall not exceed:

(i) *Hydrocarbons.* 6.0 grams per test.

(2) The standard set forth in paragraph (b)(1) of this section refers to a composite sample of the evaporative emissions collected under the conditions set forth in Subpart B of this part and measured in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any 1978 and later model year gasoline-fueled light-duty truck.

§ 86.078–10 Emission standards for 1978 gasoline-fueled heavy-duty engines.

(a)(1) Exhaust emissions from new 1978 and later model year gasoline-fueled heavy-duty engines shall not exceed:

(i) *Hydrocarbons plus oxides of nitrogen (as NO_2).* 16 grams per brake horsepower hour.

(ii) *Carbon monoxide.* 40 grams per brake horsepower hour.

(2) The standards set forth in paragraph (a)(1) of this section refer to composite samples representing the operating cycle set forth in Subpart H and measured in accordance with those procedures.

(b) [Reserved]

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any new 1978 and later model year gasoline-fueled heavy-duty engine.

(d) Every manufacturer of new motor vehicle engines subject to the standards prescribed in this subpart shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in accordance with test procedures prescribed in Subpart H to ascertain that such test engines meet the requirements of paragraphs (a) and (c) of this section.

§ 86.078–11 Emisison standards for 1978 Diesel heavy-duty engines.

(a)(1) The opacity of smoke emissions from new 1978 and later model year Diesel heavy-duty engines shall not exceed:

(i) 20 percent during the engine acceleration mode.

(ii) 15 percent during the engine lugging mode.

(iii) 50 percent during the peaks in either mode.

(2) The standards set forth in paragraph (a)(1) of this section refer to exhaust smoke emissions generated under the conditions set forth in Subpart I and measured and calculated in accordance with those procedures.

(b)(1) Exhaust gaseous emissions from new 1978 and later model year Diesel heavy-duty engines shall not exceed:

(i) *Hydrocarbons plus oxides of nitrogen (as NO_2).* 16 grams per brake horsepower hour.

(ii) *Carbon monoxide.* 40 grams per brake horsepower hour.

(2) The standards set forth in paragraph (b)(1) of this section refer to exhaust gaseous emissions generated under the conditions set forth in Subpart J and measured and calculated in accordance with those procedures.

(c)–(d) [Reserved]

(e) Every manufacturer of new motor vehicle engines subject to the standards prescribed in this subpart shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in accordance with test procedures prescribed in Subparts I and J to ascertain that such test engines meet the requirements of paragraphs (a) and (b) of this section.

§§ 86.078–12—86.078–20 [Reserved]

§ 86.078–21 Application for certification.

(a) A separate application for a certificate of conformity shall be made for each set of standards and each class of new motor vehicles or new motor vehicle engines. Such application shall be made to the Administrator by the manufacturer and shall be updated and corrected by amendment.

(b) The application shall be in writing, signed by an authorized representative of the manufacturer, and shall include the following:

(1) Identification and description of the vehicles (or engines) covered by the application and a description of their engine (vehicles only), emission control system, and fuel system components. This shall include a detailed description of each AECD to be installed in or on any certification test vehicle (or certification test engine).

(2) Projected U.S. sales data sufficient to enable the Administrator to select a test fleet representative of the vehicles (or engines) for which certification is requested.

(3) A description of the test equipment and fuel proposed to be used.

(4)(i) A description of the proposed mileage (or service) accumulation procedures for durability testing.

(ii) A description of the test procedures to be used to establish the evaporative emission deterioration factors required to be determined and supplied in § 86.078–23(b)(2).

(5) A statement of recommended maintenance and procedures necessary to assure that the vehicles (or engines) covered by a certificate of conformity in operation conform to the regulations, and a description of the program for training of personnel for such maintenance, and the equipment required.

(6) At the option of the manufacturer, the proposed composition of the emission-data and durability-data test fleet.

(c) Complete copies of the application and of any amendments thereto, and all notifications under §§ 86.078–32, 86.078–33, and 86.078–34 shall be submitted in such multiple copies as the Administrator may require.

§ 86.078–22 Approval of application for certification; test fleet selections.

(a) After a review of the application for certification and any other information which the Administrator may require, the Administrator may approve the application and select a test fleet in accordance with § 86.078–24.

(b) The Administrator may disapprove in whole or in part an application for certification for reasons including incompleteness, inaccuracy, inappropriate proposed mileage (or service) accumulation procedures, test equipment, or fuel, and incorporation of defeat devices in vehicles (or on engines) described by the application.

(c) Where any part of an application is rejected, the Administrator shall notify the manufacturer in writing and set forth the reasons for such rejection. Within 30 days following receipt of such notification, the manufacturer may request a hearing on the Administrator's determination. The request shall be in writing, signed by an authorized representative of the manufacturer and shall include a statement specifying the manufacturer's objections to the Administrator's determinations, and data in support of such objections. If, after the review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 86.078–6 with respect to such issue.

(d) The Administrator does not approve the test procedures for establishing the evaporative emission deterioration factors. The manufacturer shall submit the procedures as required in § 86.078–21(b)(4)(ii) prior to the Administrator's selection of the test fleet under § 86.078–24(b)(1) and if such procedures will involve testing of durability-data vehicles selected by the Administrator or elected by the manufacturer under § 86.078–24(c)(1), prior to initiation of such testing.

§ 86.078–23 Required data.

(a) The manufacturer shall perform the tests required by the applicable test procedures, and submit to the Administrator the following information: *Provided, however,* That:

(1) If requested by the manufacturer, the Administrator may waive any requirement of this section for testing of vehicles (or engines) for which emission data are available, or will be made available, under the provisions of § 86.078–29, or

(2) If requested by the manufacturer, the Administrator may waive any requirement of this section for testing of vehicles (or engines) at zero kilometers (or zero hours) of operation.

(b)(1) Exhaust emission durability data on such vehicles (or engines) tested in accordance with applicable test procedures and in such numbers as specified, which will show the performance of the systems installed on or incorporated in the vehicle (or engine) for extended mileage (or extended operation), as well as a record of all pertinent maintenance (all maintenance and servicing for Diesel heavy-duty engines) performed on the test vehicles (or test engines).

(2) Evaporative emission deterioration factors for each evaporative emission family—evaporative emission control system combination and all test data that are derived from testing described under § 86.078–21(b)(4)(ii) designed and conducted in accordance with good engineering practice to assure that the vehicles covered by a certificate issued under § 86.078–30 will meet the evaporative emission standards in § 86.078–8 or § 86.078–9, as appropriate, for the useful life of the vehicle.

(c) Emission data. (1) *Certification vehicles.* (i) Emission data on such vehicles tested in accordance with applicable test procedures and in such numbers as specified, which will show their emissions after zero kilometers (zero miles) and 6436 kilometers (4000 miles) of operation.

(ii) Emission data on those vehicles selected under §§ 86.078–24(b)(1)(v) and 86.078–24(b)(1)(vii)(D) and tested in accordance with the applicable test procedures of this subpart and in such

numbers as therein specified, which shall be tested at zero kilometers (zero miles) at any altitude, and under high-altitude conditions after 6436 kilometers (4000 miles) of operation at any altitude.

(2) *Certification engines.* Emission data on such engines tested in accordance with applicable emission test procedures and in such numbers as specified, which will show their emissions after zero hours and 125 hours of operation.

(d) A statement that the vehicles (or engines) for which certification is requested conform to the requirements in § 86.078–5(b) and that the descriptions of tests performed to ascertain compliance with the general standards in § 86.078–5(b) and the data derived from such tests are available to the Administrator upon request.

(e)(1) A statement that the test vehicles (or test engines) with respect to which data are submitted to demonstrate compliance with §§ 86.078–8, 86.078–9, 86.078–10, or § 86.078–11, as applicable, are in all material respects as described in the manufacturer's application for certification, have been tested in accordance with the applicable test procedures utilizing the fuels and equipment described in the application for certification and that on the basis of such tests the vehicles (or engines) conform to the requirements of the regulations in this part. If such statements cannot be made with respect to any vehicle (or engine) tested, the vehicle (or engine) shall be identified, and all pertinent data relating thereto shall be supplied to the Administrator. If, on the basis of the data supplied and any additional data as required by the Administrator, the Administrator determines that the test vehicle (or test engine) was not as described in the application for certification or was not tested in accordance with the applicable test procedures utilizing the fuels and equipment as described in the application for certification, the Administrator may make the determination that the vehicle (or engine) does not meet the applicable standards. The provisions of § 86.078–30(b) shall then be followed.

(2) For evaporative emission durability, the statement of compliance with paragraph (b)(2) of this section.

§ 86.078–24 Test vehicles and engines.

(a) (1) The vehicles or engines covered by an application for certification will be divided into groupings of engines which are expected to have similar emission characteristics throughout their useful life. Each group of engines with similar emission characteristics shall be defined as a separate engine family.

(2) To be classed in the same engine family, engines must be identical in all the following respects:

(i) The cylinder bore center-to-center dimensions.

(ii) The dimension from the centerline of the crankshaft to the centerline of the camshaft.

(iii) The dimension from the centerline of the crankshaft to the top of the cylinder block head face.

(iv) The cylinder block configuration (air cooled or water cooled; L–6, 90° V–8, etc.).

(v) The location of intake and exhaust valves and the valve sizes (within a ½-inch range on the valve head diameter).

(vi) The method of air aspiration.

(vii) The combustion cycle.

(viii) Catalytic converter characteristics; gasoline-fueled vehicles and engines only.

(ix) Thermal reactor characteristics; gasoline-fueled vehicles and engines only.

(3) Engines identical in all the respects listed in paragraph (a)(2) of this section may be further divided into different engine families if the Administrator determines that they may be expected to have different emission characteristics. This determination will be based upon a consideration of the following features of each engine:

(i) The bore and stroke.

(ii) The surface-to-volume ratio of the nominally dimensioned cylinder at the top dead center position.

(iii) The intake manifold induction port size and configuration.

(iv) The exhaust manifold port size and configuration.

(v) The intake and exhaust valve sizes.

(vi) The fuel system.

(vii) The camshaft timing and ignition or injection timing characteristics.

(4) Where engines are of a type which cannot be divided into engine families based upon the criteria listed in paragraphs (a)(2) and (3) of this section, the Administrator will establish families for those engines based upon the features most related to their emission characteristics.

(5) The gasoline-fueled vehicles covered by an application for certification will be divided into groupings which are expected to have similar evaporative emission characteristics throughout their useful life. Each group of vehicles with similar evaporative emission characteristics shall be defined as a separate evaporative emission family.

(6) To be classed in the same evaporative emission family, vehicles must be similar with respect to:

(i) Type of vapor storage device (e.g., canister, air cleaner, crankcase).

(ii) Canister design characteristics.

(iii) Fuel system characteristics.

(7) Where vehicles are of a type which cannot be divided into evaporative emission families based on the criteria listed above, the Administrator will establish families for those vehicles based upon the features most related to their evaporative emission characteristics.

(b) Emission data. (1) *Emission-data vehicles.* Paragraph (b)(1) of this section applies to light-duty vehicle and light-duty truck emission-data vehicles.

(i) Vehicles will be chosen to be operated and tested for emission data based upon the engine family groupings. Within each engine family, the requirements of this paragraph must be met.

(ii) Vehicles for each engine family will be divided into engine displacement-exhaust emission control system combinations as applicable. A projected sales volume will be established for each combination for the model year for which certification is sought. One vehicle of each combination will be selected in order of decreasing projected sales volume until 70 percent of the projected sales of a manufacturer's total production of vehicles of that engine family is represented, or until a maximum of four vehicles is selected. If any single combination represents over 70 percent, then two vehicles of that combination may be selected. The vehicle selected for each combination will be specified by the Administrator as to such features as engine code, transmission type, fuel system, and inertia weight class.

(iii) The Administrator may select a maximum of four additional vehicles within each engine family based upon features indicating that they may have the highest emission levels of the vehicles in that engine family. In selecting these vehicles, the Administrator will consider such features as the emission control system combination, induction system characteristics, ignition system characteristics, fuel system, rated horsepower, rated torque, compression ratio, inertia weight class, transmission options, and axle ratio.

(iv) If the vehicles selected in accordance with paragraphs (b)(1)(ii) and (iii) of this section do not represent each engine-system combination, then one vehicle of each engine-system combination not represented will be selected by the Administrator. The vehicle selected shall be of the engine displacement with the largest projected sales volume of vehicles with the control system combination in the engine family and will be designated by the Administrator as to such features as engine code, transmission type, fuel system, and inertia weight class.

(v) The Administrator will also select one vehicle for each engine-system combination within an engine family for which vehicles are to be sold to ultimate purchasers at high altitude.

(vi) The Administrator may combine testing requirements for any vehicle selected under paragraph (b)(1)(v) or (b)(1)(vii)(D) of this section with the testing requirements for any similar vehicle in the same engine-system combination selected under paragraph (b)(1)(ii), (iii), or (iv) of this section or any similar vehicle in the same engine-system, evaporative emission family, evaporative emission control system combination selected under paragraph (b)(1)(vii)(A) or (B) of this section. The testing requirements may be combined by the Administrator by requiring a vehicle selected for testing under paragraphs (b)(1)(ii), (iii), (iv), (vii)(A), or (vii)(B) of this section to be modified (if necessary) after mileage accumulation and emission testing for the purpose of demonstrating compliance with § 86.078–23(c)(1)(ii).

(vii)(A) Vehicles of each evaporative emission family will be divided into evaporative emission control systems.

One vehicle of each evaporative emission control system within the evaporative emission family will be selected.

(B) The Administrator may select a maximum of four additional vehicles within each evaporative emission family based upon features indicating that they may have the highest evaporative emission levels of vehicles in that family.

(C) The Administrator may determine that the vehicles selected under paragraphs (b)(1)(ii) through (iv) of this section may be used to satisfy the requirements of paragraphs (b)(1)(vii)(A) and (B) of this section.

(D) The Administrator will also select one vehicle for each evaporative emission control system within each evaporative family for which vehicles are to be sold at high altitude.

(E) Vehicles selected under (b)(1)(v) may be used to satisfy the requirements of (b)(1)(vii)(D).

(2) *Gasoline-fueled heavy-duty emission-data engines.* Paragraph (b)(2) of this section applies to gasoline-fueled heavy-duty engines.

(i) Engines will be chosen to be run for emission data based upon engine family groupings. Within each engine family, the requirements of this paragraph must be met.

(ii) Engines of each engine family will be divided into engine displacement-exhaust emission control system combinations. A projected sales volume will be established for each combination for the applicable model year. One engine of each combination will be selected in order of decreasing projected sales volume until 70 percent of the projected sales of a manufacturer's total production of engines of that family is represented, or until a maximum of four engines is selected. The engines selected for each combination will be specified by the Administrator as to fuel system.

(iii) The Administrator may select a maximum of two additional engines within each engine family based upon features indicating that they may have the highest emission levels of the engines in that engine family. In selecting these engines, the Administrator will consider such features as the exhaust emission control system, induction system characteristics, ignition system characteristics, fuel system, rated horsepower, rated torque, and compression ratio.

(iv) If the engines selected in accordance with paragraphs (b)(2)(ii) and (iii) of this section do not represent each engine displacement-exhaust emission control system combination, then one engine of each engine displacement-exhaust emission control system combination not represented shall be selected by the Administrator.

(3) *Diesel heavy-duty emission-data engines.* Paragraph (b)(3) of this section applies to Diesel heavy-duty emission-data engines.

(i) Engines will be chosen to be run for emission data based upon engine family groupings. Within each engine family, the requirements of this paragraph must be met.

(ii) Engines of each engine family will be divided into groups based upon exhaust emission control system. One engine of each engine-system combination shall be run for smoke emission data and gaseous emission data as prescribed in § 86.078-26(c)(3). Either the complete gaseous emission test or the complete smoke test may be conducted first. Within each combination, the engine that features the highest fuel feed per stroke, primarily at the speed of maximum rated torque and secondarily at rated speed, will usually be selected. If there are military engines with higher fuel rates than other engines in the same engine-system combination, then one military engine shall also be selected. The engine with the highest fuel feed per stroke will usually be selected.

(iii) The Administrator may select a maximum of one additional engine within each engine-system combination based upon features indicating that it may have the highest emission levels of the engines of that combination. In selecting this engine, the Administrator will consider such features as the injection system, fuel system, compression ratio, rated speed, rated horsepower, peak torque speed, and peak torque.

(c) Durability data. (1) *Durability-data vehicles.* Paragraph (c)(1) of this section applies to light-duty vehicle and light-duty truck durability-data vehicles.

(i) A durability-data vehicle will be selected by the Administrator to represent each engine-system combination. The vehicle selected shall be of the engine displacement with the largest projected sales volume of vehicles with that control-system combination in that engine family and will be designated by the Administrator as to transmission type, fuel system, and inertia weight class.

(ii) A manufacturer may elect to operate and test additional vehicles to represent any engine-system combination. The additional vehicles must be of the same engine displacement, transmission type, fuel system, and inertia weight class as the vehicle selected for that engine-system combination in accordance with the provisions of paragraph (c)(1)(i) of this section. Notice of an intent to operate and test additional vehicles shall be given to the Administrator not later than 30 days following notification of the test fleet selection.

(2) *Gasoline-fueled heavy-duty durability-data engines.* Paragraph (c)(2) of this section applies to gasoline-fueled heavy-duty durability-data engines.

(i) A durability-data engine will be selected by the Administrator to represent each engine-system combination. The engine selected shall be of the displacement with the largest projected sales volume of engines with that exhaust emission control system in that engine family and will be designated by the Administrator as to fuel system.

(ii) [Reserved.]

(iii) A manufacturer may elect to operate and test additional engines to represent any engine-system combination. The additional engines must be of the same engine displacement and fuel system as the engine selected for that combination in accordance with the provisions of paragraph (c)(2)(i) of this section. Notice of an intent to run additional engines shall be given to the Administrator not later than 30 days following notification of the test fleet selection. Deterioration factors calculated for each engine-system combination shall be applied separately to military and nonmilitary engines within the same engine-system combination.

(3) *Diesel heavy-duty durability-data engines.* Paragraph (c)(3) of this section applies to Diesel heavy-duty durability-data engines.

(i) One engine from each engine-system combination shall be tested as prescribed in § 86.078-26(c)(3)(ii). At each test point, either the complete gaseous emission test or the complete smoke test may be conducted first. Within each combination, the engine which features the highest fuel feed per stroke, primarily at rated speed and secondarily at the speed of maximum rated torque, will usually be selected for durability testing. In the case where more than one engine in an engine-system combination has the highest fuel feed per stroke, the engine with the highest maximum rated horsepower will usually be selected for durability testing. If an engine-system combination includes both military and nonmilitary engines, then the nonmilitary engine with the highest maximum rated horsepower will usually be selected for durability testing.

(ii) A manufacturer may elect to operate and test additional engines to represent any engine-system combination. The additional engines must be of the same model and fuel system as the engine selected in accordance with the provisions of paragraph (c)(3)(i) of this section. Notice of an intent to test additional engines shall be given to the Administrator not later than 30 days following notification of the test fleet selection. Deterioration factors calculated for each engine-system combination shall be applied separately to military and nonmilitary engines within the same engine-system combination.

(d) For purposes of testing under § 86.078-26 (a)(9), (b)(9) or (c)(11), the Administrator may require additional emission-data vehicles (or emission-data engines) and durability-data vehicles (or durability-data engines) identical in all material respects to vehicles (or engines) selected in accordance with paragraphs (b) and (c) of this section: *Provided,* That the number of vehicles selected shall not increase the size of either the emission-data fleet or the durability-data fleet by more than 20 percent or one vehicle, whichever is greater.

(e) Any manufacturer whose projected sales for the model year in which certification is sought is less than

(1) 2000 gasoline-fueled light-duty vehicles, or

(2) 2000 Diesel light-duty vehicles, or

(3) 2000 gasoline-fueled light-duty trucks, or

(4) 2000 Diesel light-duty trucks, or

(5) 700 gasoline-fueled heavy-duty engines, or

(6) 200 Diesel heavy-duty engines, may request a reduction in the number of test vehicles (or engines) determined in accordance with the foregoing provisions of this section. The Administrator may agree to such lesser number as he determines would meet the objectives of this procedure.

(f) In lieu of testing an emission-data or durability-data vehicle (or engine) selected under paragraph (b) or (c) of this section, and submitting data therefor, a manufacturer may, with the prior written approval of the Administrator, submit exhaust emission data and/or fuel evaporative emission data, as applicable on a similar vehicle (or engine) for which certification has previously been obtained or for which all applicable data required under § 86.078–23 has previously been submitted.

(g) (1) This paragraph applies to light-duty vehicles and light-duty trucks.

(2) Where it is expected that more than 33 percent of the vehicles in an engine family will be equipped with an optional item, the full estimated weight of that item shall be included, if required by the Administrator, in the curb weight computation for each vehicle available with that option in the engine family. Where it is expected that 33 percent or less of the vehicles in an engine family will be equipped with an item of optional equipment, no weight for that item will be added in computing curb weight. In the case of mutually exclusive options, only the weight of the heavier option will be added in computing curb weight. Optional equipment weighing less than 3 pounds per item need not be considered.

(3) Where it is expected that more than 33 percent of the vehicles in an engine family will be equipped with an item of optional equipment that can reasonably be expected to influence emissions, then such items of optional equipment shall actually be installed, unless specifically excluded by the Administrator, on all emission-data and durability-data vehicles in the engine family on which the option is intended to be offered in production. Optional equipment that can reasonably be expected to influence emissions are the air conditioner, power steering, power brakes and other items determined by the Administrator.

(4) Optional equipment that can reasonably be expected to influence emissions which is utilized on 33 percent or less of the vehicles in the engine family shall not be installed on any vehicle in that engine family unless specifically required under this section.

§ 86.078–25 Maintenance.

(a) *Light-duty vehicles and light-duty trucks.* Paragraph (a) of this section applies to light-duty vehicles and light-duty trucks.

(1) Scheduled maintenance on the engine, emission control system, and fuel system of durability-data vehicles, selected by the Administrator or elected by the manufacturer under § 86.078–24 (c) (1), shall be scheduled for performance during durability testing at the same mileage intervals that will be specified in the manufacturer's maintenance instructions furnished to the ultimate purchaser of the motor vehicle. Such maintenance shall be performed, except as provided in paragraph (a) (5) (iii) of this section, only under the following provisions:

(i) Scheduled major engine tuneups to manufacturer's specifications may be performed no more frequently than every 12,500 miles of scheduled driving, provided that no tuneup may be performed after 45,000 miles of scheduled driving. A scheduled major engine tuneup shall be restricted to paragraph (a) (1) (i) (A) or (B) of this section, as applicable, and shall be conducted in a manner consistent with service instructions and specifications provided by the manufacturer for use by customer service personnel.

(A) *For gasoline-fueled vehicles,* the following items may be inspected, replaced, cleaned, adjusted, and/or serviced as required:

(*1*) Ignition system.

(*2*) Cold starting enrichment systems (includes fast idle speed setting).

(*3*) Curb idle speed and air/fuel mixture.

(*4*) Drive belt tension on engine accessories.

(*5*) Valve lash.

(*6*) Inlet air and exhaust gas control valves.

(*7*) Engine bolt torque.

(*8*) Spark plugs.

(*9*) Fuel filter and air filter.

(*10*) Crankcase emission control system.

(*11*) Fuel evaporative emission control system.

(B) *For Diesel vehicles,* a major engine tuneup shall be restricted to the following:

(*1*) Adjust low idle speed.

(*2*) Adjust valve lash if required.

(*3*) Adjust injector timing.

(*4*) Adjust governor.

(*5*) Clean and service injector tips.

(*6*) Adjust drive belt tension on engine accessories.

(*7*) Check engine bolt torque and tighten as required.

(ii) Change of engine and transmission oil, and change or service of oil filter will be allowed at the same mileage intervals that will be specified in the manufacturer's maintenance instructions.

(iii) Readjustment of the engine idle speed (curb idle and fast idle) may be performed, in addition to adjustment during scheduled major engine tuneups, once during the first 5,000 miles of vehicle operation.

(2) (i) *For gasoline-fueled vehicles,* unscheduled maintenance on the engine, emission control system and fuel system of durability-data vehicles may be performed, except as provided in paragraph (a) (5) (i) of this section, only under the following provisions:

(A) Any persistently misfiring spark plug may be replaced in addition to replacement at scheduled major engine tuneup points.

(B) Readjustment of the engine cold starting enrichment system may be performed if there is a problem of stalling or if there is visible black smoke.

(C) Readjustment of the engine idle speed (curb idle and fast idle) may be performed in addition to that performed as scheduled maintenance under paragraph (a) (1) of this section if the idle speed exceeds the manufacturer's recommended idle speed by 300 r.p.m. or more, or if there is a problem of stalling.

(D) The idle mixture may be reset other than during scheduled major engine tuneups, only with the advance approval of the Administrator.

(ii) For Diesel vehicles, unscheduled maintenance on the engine, emission control system and fuel system of durability-data vehicles may be performed, except as provided in paragraph (a) (5) (i) of this section, only under the following provisions:

(A) Injectors may be changed if a persistent misfire is detected.

(B) Readjustment of the engine idle speed (curb idle and fast idle) may be performed in addition to that performed as scheduled maintenance under paragraph (a) (1) of this section, if the idle speed exceeds the manufacturer's recommended idle speed by 300 r.p.m. or more, or if there is a problem of stalling.

(3) An exhaust gas recirculation (EGR) system may be serviced during durability testing only under one of the following provisions:

(i) Manufacturers may schedule service to the EGR system at the scheduled major engine tuneups if an audible and/or visual signal approved by the Administrator alerts the vehicle operator to the need for EGR system maintenance at each of those mileage points. One additional servicing may also be performed as unscheduled maintenance if there is an overt indication of malfunction and if the malfunction or repair of the malfunction does not render the test vehicle unrepresentative of vehicles in use.

(ii) Manufacturers may service the EGR system as unscheduled maintenance a maximum of three times during the 50,000 miles if failure of the EGR system activates an audible and/or visual signal approved by the Administrator which alerts the vehicle operator to the need for EGR system maintenance. One additional servicing may also be performed as unscheduled maintenance if there is an overt indication of malfunction and if the malfunction or repair of the malfunction does not render the test vehicle unrepresentative of vehicles in use.

(iii) Manufacturers may service the EGR system a maximum of three times during the 50,000 miles either at a scheduled major engine tune-up point or as unscheduled maintenance, if an audible and/or visual signal approved by the Administrator alerts the vehicle operator to the need for EGR system maintenance. The signal may be activated either by EGR system failure (unscheduled maintenance) or need for scheduled periodic maintenance. If maintenance is performed, the signal for scheduled periodic maintenance shall be reset. One additional servicing may also be performed

as unscheduled maintenance if there is an overt indication of malfunction and if the malfunction or repair of the malfunction does not render the test vehicle unrepresentative of the vehicles in use.

(iv) Manufacturers may schedule service to the EGR system at the scheduled major engine tuneup(s) if failure to perform EGR system maintenance is not likely, as determined by the Administrator, to result in an improvement in vehicle performance. One additional servicing may also be performed as unscheduled maintenance if there is an overt indication of malfunction and if the malfunction or repair of the malfunction does not render the test vehicle unrepresentative of vehicles in use.

(4) The catalytic converter may be serviced once during 50,000 miles if an audible and/or visual signal approved by the Administrator alerts the vehicle operator to the need for maintenance. The signal may be activated either by component failure or need for maintenance at a scheduled point.

(5) Any other engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement on durability-data vehicles shall be performed only with the advance approval of the Administrator.

(i) In the case of unscheduled maintenance, such approval will be given if the Administrator:

(A) Has made preliminary determination that part failure or system malfunction, or the repair of such failure or malfunction, does not render the vehicle unrepresentative of vehicles in use, and does not require direct access to the combustion chamber, except for spark plug, fuel injection component, or removable prechamber removal or replacement (as applicable); and

(B) Has made a determination that the need for maintenance or repairs is indicated by an overt indication of malfunction such as persistent misfiring, vehicle stalling, overheating, fluid leakage, loss of oil pressure, or charge indicator warning. For the evaporative emission control system, this overt indication may be indicated by such items as fuel odor or fluid leakage.

(ii) Emission measurements may not be used as a means of determining the need for unscheduled maintenance under paragraph (a)(5)(i)(A) of this section.

(iii) Requests for authorization of scheduled maintenance of emission control-related components not specifically authorized to be maintained by these regulations must be made prior to the beginning of durability testing. The Administrator will approve the performance of such maintenance if the manufacturer makes a satisfactory showing that the maintenance will be performed on vehicles in use.

(6) If the Administrator determines that part failure or system malfunction occurrence and/or repair rendered the vehicle unrepresentative of vehicles in use, the vehicle shall not be used as a durability-data vehicle.

(7) Where the Administrator agrees under § 86.078–26 to a mileage accumulation of less than 50,000 miles for durability testing, he may modify the requirements of this paragraph.

(8)(i) Adjustment of engine idle speed on emission-data vehicles may be performed once before the 6436-kilometer (4000-mile) test point. Any other engine, emission control system or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement on emission-data vehicles shall be performed only with the advance approval of the Administrator.

(ii) Maintenance on emission-data vehicles selected under § 86.078–24 (b)(1)(v) or (b)(1)(vii)(D) and permitted to be tested for purposes of § 86.078–23(c)(1)(ii) under the provisions of § 86.078–24(b)(1)(vi) may be performed in conjunction with emission control system modifications at the 6436-kilometer (4000-mile) test point, and shall be performed in accordance with the maintenance instructions to be provided to the ultimate purchaser required under § 86.078–38.

(iii) Maintenance on those emission-data vehicles selected under § 86.078–24 (b)(1)(v) which are not capable of being modified in the field for the purpose of complying with emission standards at an altitude other than intended by the original design may be performed in conjunction with the emission control system modifications at the 6436-kilometer (4000-mile) test point and shall be approved in advance by the Administrator.

(9) Repairs to vehicle components of the durability-data or emission-data vehicle other than the engine, emission control system, or fuel system, shall be performed only as a result of part failure, vehicle system malfunction, or with the advance approval of the Administrator.

(10) Complete emission tests (see §§ 86.106 through 86.145) are required, unless waived by the Administrator, before and after any vehicle maintenance which may reasonably be expected to affect emissions. These test data shall be air posted to the Administrator within 24 hours (or delivered within 3 working days) after the test along with a complete record of all pertinent maintenance including a preliminary engineering report of any malfunction diagnosis and corrective action taken. A complete engineering report shall be delivered or air posted to the Administrator within 10 working days after the tests. In addition, all test data and maintenance reports shall be compiled and provided to the Administrator in accordance with § 86.078–23.

(11) The Administrator shall be given the opportunity to verify the existence of an overt indication of part failure and/or vehicle malfunction (e.g., misfiring, stalling, and/or black smoke), or an activation of an audible and/or visual signal, prior to the performance of any maintenance to which such overt indication or signal is relevant under the provisions of this section.

(12) Equipment, instruments, or tools may not be used to identify malfunctioning, maladjusted, or defective engine components unless the same or equivalent equipment, instruments, or tools will be available to dealerships and other service outlets, and:

(i) Are used in conjunction with scheduled maintenance on such components.

(ii) Are used subsequent to the identification of a vehicle or engine malfunction, as provided in paragraph (a)(5)(i) of this section for durability-data vehicles or paragraph (a)(8)(i) of this section for emission-data vehicles, or

(iii) Unless specifically authorized by the Administrator.

(b) [Reserved]

(c)(1) *Gasoline-fueled heavy-duty engines.* Paragraph (c) of this section applies to gasoline-fueled heavy-duty engines.

(2)(i) Scheduled maintenance may be performed on durability-data engines only under the following provisions:

(A) Major engine tuneups to manufacturer's specifications may be performed no more frequently than every 375 hours of scheduled dynamometer operation: *Provided,* No tuneups are performed after 1375 hours of scheduled dynamometer operation. The maintenance to be performed on the durability-data engines shall be requested in the application for certification and shall be specified at the same intervals in the maintenance instructions which will be furnished to the ultimate purchaser of the vehicle in which the engine, which is represented by the test engine, is installed. (For equivalent dynamometer hours, engine hours, and mileage intervals, see § 86.078–2. A scheduled major engine tuneup shall be restricted to paragraphs (c)(2)(i)(A) (*1*) through (*12*) of this section and shall be conducted in a manner consistent with service instructions and specifications provided by the manufacturer for use by the customer service personnel. The following items may be inspected, replaced, cleaned, adjusted, and/or serviced as required:

(*1*) Ignition system.

(*2*) Cold starting enrichment system (includes fast idle speed setting).

(*3*) Curb idle speed and air/fuel mixture.

(*4*) Drive belt tension on engine accessories.

(*5*) Valve lash.

(*6*) Inlet air and exhaust gas control valves.

(*7*) Engine bolt torque.

(*8*) Spark plugs.

(*9*) Fuel filter and air filter.

(*10*) Crankcase emission control system.

(*11*) Fuel evaporative emission control system.

(*12*) Exhaust gas recirculation system.

(B) Change of engine oil, and change or service of oil filter will be allowed at the equivalent intervals that will be specified in the manufacturer's maintenance instructions.

(C) Readjustment of the engine idle speed (curb idle and fast idle) may be performed, in addition to during scheduled major engine tuneups, once during the first 125 hours of engine operation.

(ii) Unscheduled maintenance may be performed on durability-data engines, except as provided in paragraph (c)(v)(A) of this section, only under the following provisions:

(A) Any persistently misfiring spark plug may be replaced in addition to replacement at scheduled major engine tuneup points.

(B) Readjustment of the engine cold starting enrichment system may be performed if there is a problem of stalling or if there is visible black smoke.

(C) Readjustment of the engine idle speed (curb idle and fast idle) may be performed, in addition to that performed as scheduled maintenance under paragraph (c)(2)(i) of this section, if the idle speed exceeds the manufacturer's recommended idle speed by 300 r.p.m. or more, or if there is a problem of stalling.

(D) The idle mixture may be reset, other than during scheduled major engine tuneups, only with the advance approval of the Administrator.

(iii)–(iv) [Reserved]

(v) Any other engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement on durability-data engines shall be performed only with the advance approval of the Administrator.

(A) In the case of unscheduled maintenance such approval will be given if the Administrator:

(*1*) Has made a preliminary determination that part failure or system malfunction, or the repair of such failure or malfunction, does not render the engine unrepresentative of engines in use, and does not require direct access to the combustion chamber, except for spark plug, fuel injection component, or removable prechamber removal or replacement; and

(*2*) Has made a determination that the need for maintenance or repairs is indicated by an overt indication of malfunction such as persistent misfiring, engine stalling, overheating, fluid leakage, loss of oil pressure, excessive fuel consumption or excessive power loss.

(B) Emission measurements may not be used as a means of determining the need for unscheduled maintenance under paragraph (c)(2)(v)(A)(*1*) of this section.

(C) Requests for authorization of scheduled maintenance of emission control-related components not specifically authorized to be maintained by these regulations must be made prior to the beginning of durability testing. The Administrator will approve the performance of such maintenance if the manufacturer makes a satisfactory showing that the maintenance will be performed on engines in use.

(vi) If the Administrator determines that part failure or system malfunction occurrence and/or repair rendered the engine unrepresentative of engines in use, the engine shall not be used as a durability-data engine.

(3)(i) Scheduled maintenance on emission-data engines is limited to the adjustment of idle speed once before the 125-hour test point: *Provided,* The idle speed is outside the manufacturer's specifications to be shown on the engine label (see § 86.078–35(a)(2)(iii)).

(ii) Any other engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement shall be performed only with the advance approval of the Administrator.

(4) [Reserved]

(5)(i) Complete emission tests (see § 86.777–5 through 86.777–15) are required unless waived by the Administrator, before and after:

(A) Scheduled maintenance approved for durability-data engines.

(B) Unscheduled maintenance which may reasonably be expected to affect emissions.

(ii) The tests before and after scheduled maintenance, which are performed on durability-data engines prior to 117 hours, are waived. The test before scheduled maintenance, which is performed on durability-data engines after 117 hours and prior to 133 hours, is waived. The after-maintenance test must be run and the results used in the deterioration factor calculation in accordance with § 86.078–28(b)(4)(i)(A)(*2*).

(iii) The idle speed reset and any scheduled maintenance on the emission-data engine shall be performed prior to the 125-hour test. The before-maintenance and after-maintenance tests associated with idle speed reset and scheduled maintenance on the emission-data engine are waived.

(iv) Test data required by this paragraph shall be air posted to the Administrator within 72 hours (or delivered within 5 working days), along with a complete record of all pertinent maintenance.

(v) When unscheduled maintenance is approved, a preliminary engineering report, unless waived by the Administrator, shall be air posted within 72 hours (or delivered within 5 working days). A final engineering report shall be delivered or air posted within 10 working days after the completion of the emission tests. The Administrator may approve an extension of the time requirements for the final engineering report.

(vi) All test data, maintenance reports, and required engineering reports shall be compiled and provided to the Administrator in accordance with § 86.078–23.

(6) The Administrator shall be given the opportunity to verify the existence of an overt indication of part failure and/or engine malfunction (e.g., misfiring, stalling).

(7) Equipment, instruments, or tools may not be used to identify malfunctioning, maladjusted, or defective engine components unless the same or equivalent equipment, instruments, or tools will be available to dealerships and other service outlets, and

(i) Are used in conjunction with scheduled maintenance on such components;

(ii) Are used subsequent to the identification of an engine failure or malfunction, as provided in paragraph (c)(2)(v)(A) of this section for durability-data engines or paragraph (c)(3) of this section for emission-data engines; or

(iii) Unless specifically authorized by the Administrator.

(d)(1) *Diesel heavy-duty engines.* Paragraph (d) of this section applies to Diesel heavy-duty engines.

(2)(i) Scheduled maintenance may be performed on durability-data engines only under the following provisions:

(A) One major engine servicing to manufacturer's specifications may be performed prior to 875 hours (±8 hours) of scheduled dynamometer operation provided such maintenance is requested in the application for certification and is specified in the maintenance instructions which will be furnished to the ultimate purchaser of the motor vehicle in which the engine, which is represented by the test engine, is installed. (For equivalent dynamometer hours, engine hours, and mileage intervals, see § 86.078–2.) A scheduled major servicing shall be restricted to paragraphs (d)(2)(i)(A)(*1*) through (*7*) of this section and shall be conducted in a manner consistent with service instructions and specifications provided by the manufacturer for use by customer service personnel. The following items may be inspected, replaced, cleaned, adjusted, and/or serviced as required:

(*1*) Low idle speed.
(*2*) Drive belt tension.
(*3*) Engine bolt torque.
(*4*) Valve lash.
(*5*) Injection timing.
(*6*) Injector assemblies.
(*7*) Governor settings.

(B) Normal engine servicing such as engine oil change, and oil filter, fuel filter, and air filter cleaning or replacement will be allowed at the manufacturer's recommended intervals. If approved in advance by the Administrator, the maintenance for these items may differ from that specified in the manufacturer's maintenance instructions.

(C) Readjustment of the engine low idle speed may be performed once during the first 125 hours of engine operation.

(ii) Unscheduled maintenance may be performed on durability-data engines, except as provided in paragraph (d)(2)(v)(A) of this section, only under the following provisions:

(A) Injectors may be changed if a persistent misfire is detected.

(B) Readjustment of the engine idle speed (curb idle and fast idle) may be performed, in addition to that performed as scheduled maintenance under paragraph (d)(2)(i) of this section, if the idle speed exceeds the manufacturer's recommended idle speed by 300 r.p.m. or more, or if there is a problem of stalling.

(iii)–(iv) [Reserved.]

(v) Any other engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement on durability-data engines shall be performed only with the advance approval of the Administrator.

(A) In the case of unscheduled maintenance such approval will be given if the Administrator:

(1) Has made a preliminary determination that part failure or system malfunction, or the repair of such failure or malfunction does not render the engine unrepresentative of engines in use, and does not require direct access to the combustion chamber, except for fuel injection component, or removable prechamber removal or replacement; and

(2) Has made a determination that the need for maintenance or repairs is indicated by an overt indication of malfunction such as persistent misfiring, engine overheating, fluid leakage, loss of oil pressure, excessive fuel consumption, or excessive power loss.

(B) Emission measurements may not be used as a means of determining the need for unscheduled maintenance under paragraph (d)(2)(v)(A)(*1*) of this section.

(C) Requests for authorization of scheduled maintenance of emission-control-related components not specifically authorized to be maintained by these regulations must be made prior to the beginning of durability testing. The Administrator will approve the performance of such maintenance if the manufacturer makes a satisfactory showing that the maintenance will be performed on engines in use.

(vi) If the Administrator determines that part failure or system malfunction occurrence and/or repair rendered the engine unrepresentative of engines in use, the engine shall not be used as a durability-data engine.

(3)(i) Scheduled maintenance on emission-data engines is limited to the adjustment of idle speed once before the 125-hour test point, provided the idle speed is outside the manufacturer's specifications shown on the engine label (see § 86.078–35(a)(iii)).

(ii) Any other engine, emission-control system, or fuel system adjustment, repair, removal, disassembly, cleaning, servicing, or replacement shall be performed only with the advance approval of the Administrator.

(4) [Reserved.]

(5)(i) Complete emission tests (see §§ 86.877–5 through 86.877–14 and §§ 86.977–5 through 86.977–15) are required, unless waived by the Administrator, before and after:

(A) Scheduled maintenance approved for durability-data engines.

(B) Unscheduled maintenance which may reasonably be expected to affect emissions.

(ii) The tests before and after scheduled maintenance, which are performed on durability-data engines prior to 117 hours are waived. The test before scheduled maintenance, which is performed on durability-data engines after 117 hours and prior to 133 hours, is waived. The after-maintenance test must be run and the results used in the deterioration factor calculation in accordance with § 86.078–28(c)(4)(i)(B) or (C).

(iii) The idle speed reset and any scheduled maintenance on the emission-data engine shall be performed prior to the 125-hour test. The before-maintenance and after-maintenance test associated with idle speed reset and scheduled maintenance on the emission-data engine are waived.

(iv) Test data required by this paragraph shall be air posted to the Administrator within 72 hours of the test completion (or delivered within 5 working days), along with a complete record of all pertinent maintenance.

(v) When unscheduled maintenance is approved, a preliminary engineering report, unless waived by the Administrator, shall be air posted within 72 hours (or delivered within 5 working days). A final engineering report shall be delivered or air posted within 10 working days after the completion of the emission tests. The Administrator may approve an extension of the time requirements for the final engineering report.

(vi) All test data, maintenance reports and required engineering reports shall be compiled and provided to the Administrator in accordance with § 86.078–23.

(6) The Administrator shall be given the opportunity to verify the existence of an overt indication of part failure and/or engine malfunction (e.g., misfiring, stalling).

(7) Equipment, instruments, or tools may not be used to identify malfunctioning, maladjusted, or defective engine components unless the same or equivalent equipment, instruments, or tools will be available to dealerships and other service outlets and

(i) Are used in conjunction with scheduled maintenance on such components;

(ii) Are used subsequent to the identification of an engine failure or malfunction, as provided in paragraph (d)(2)(v)(A) of this section for durability-data engines or paragraph (d)(3) of this section for emission-data engines; or

(iii) Unless specifically authorized by the Administrator.

§ 86.078–26 Mileage and service accumulation; emission measurements.

(a)(1) Paragraph (a) of this section applies to light-duty vehicles and light-duty trucks.

(2) The procedure for mileage accumulation will be the Durability Driving Schedule as specified in Appendix IV of this part. A modified procedure may also be used if approved in advance by the Administrator. Except with the advance approval of the Administrator, all vehicles will accumulate mileage at a measured curb weight which is within 100 pounds of the estimated curb weight. If the loaded vehicle weight is within 100 pounds of being included in the next higher inertia weight class as specified in § 86.129, the manufacturer may elect to conduct the respective emission tests at the inertia weight corresponding to the higher loaded vehicle weight.

(3) *Emission-data vehicles.* Unless as otherwise provided for in § 86.078–23(a), emission-data vehicles shall be operated and tested as follows:

(i) *Gasoline-fueled.* (A) Each gasoline-fueled emission-data vehicle shall be driven 4000 miles with all emission control systems installed and operating. Complete exhaust emission tests shall be conducted at zero and 4000 miles on those vehicles selected under § 86.078–24(b)(1)(ii) through (b)(1)(v). Complete exhaust and evaporative emission tests shall be conducted at zero miles and 4000 miles on those vehicles selected under § 86.078–24(b)(1)(vii). The manufacturer may at his option test the vehicles selected under § 86.078–24(b)(1)(vii) up to three times at the 4000-mile test point as long as the ±250-mile test tolerance is adhered to. The Administrator may determine under § 86.078–24(f) that no testing is required.

(B) The emission-data vehicle(s) selected for testing under § 86.078–24(b)(1)(v) or (b)(1)(vii)(D) shall be driven 6436 kilometers (4000 miles) at any altitude. Emission tests shall be conducted at zero kilometers (zero miles) at any altitude and 6436 kilometers (4000 miles) under high-altitude conditions.

(C) The emission-data vehicle(s) selected for testing under § 86.078–24(b)(1)(v) or (b)(1)(vii)(D) and permitted to be tested for purposes of § 86.078–23(c)(1)(ii) under the provisions of § 86.078–24(b)(1)(vi) shall be driven 6436 kilometers (4000 miles) at low altitude. Emission tests shall be conducted at zero kilometers (zero miles) at low altitude and 6436 kilometers (4000 miles) under both low- and high-altitude conditions. For the purposes of this subparagraph, "low altitude" means any elevation less than 549 meters (1800 feet).

(ii) *Diesel.* (A) Each Diesel emission-data vehicle shall be driven 6436 kilometers (4000 miles) with all emission control systems installed and operating. Emission tests shall be conducted at zero kilometers (zero miles) and 6436 kilometers (4000 miles).

(B) The emission-data vehicle(s) selected for testing under § 86.078–24(b)(1)(v) shall be driven 6436 kilometers (4000 miles) at any altitude. Emission tests shall be conducted at zero kilometers (zero miles) at any altitude and 6436 kilometers (4000 miles) under high-altitude conditions.

(C) The emission-data vehicle(s) selected for testing under § 86.078–24(b)(1)(v) and permitted to be tested for purposes of § 86.078–23(c)(1)(ii) under the provisions of § 86.078–24(b)(1)(vi) shall be driven 6436 kilometers (4000 miles) at low altitude. Emission tests shall be conducted at zero kilometers (zero miles) at low altitude and 6436 kilometers (4000 miles) under both low- and high-altitude conditions. For the purpose of this subparagraph "low altitude" means any elevation less than 549 meters (1800 feet).

(4) *Durability-data vehicles.* Unless as otherwise provided for in § 86.078–23(a), durability-data vehicles shall be operated and tested as follows:

(i) *Gasoline-fueled.* Each gasoline-fueled durability-data vehicle selected by the Administrator or elected by the manufacturer under § 86.078–24(c)(1) shall be driven, with all emission control

systems installed and operating, for 50,000 miles or such lesser distance as the Administrator may agree to as meeting the objective of this procedure. Complete exhaust emission tests shall be made on all durability-data vehicles selected by the Administrator or elected by the manufacturer under § 86.078–24(c) at the following mileage points: 0; 5,000; 10,000; 15,000; 20,000; 25,000; 30,000; 35,000; 40,000; 45,000; 50,000. The Administrator may determine under § 86.078–24(f) that no testing is required.

(ii) *Diesel.* Each Diesel durability-data vehicle shall be driven, with all emission control systems installed and operating, for 50,000 miles or such lesser distance as the Administrator may agree to as meeting the objectives of the procedure. Complete emission tests (see §§ 86.106 through 86.145) shall be made at the following mileage points: 0; 5,000; 10,000; 15,000; 20,000; 25,000; 30,000; 35,000; 40,000; 45,000; 50,000.

(5) All tests required by this subpart to be conducted after every 5,000 miles of driving for durability-data vehicles and 4,000 miles for emission-data vehicles must be conducted at any accumulated mileage within 250 miles of each of those test points.

(6)(i) The results of each emission test shall be supplied to the Administrator immediately after the test. The manufacturer shall furnish to the Administrator explanation for voiding any test. The Administrator will determine if voiding the test was appropriate based upon the explanation given by the manufacturer for the voided test. If a manufacturer conducts multiple tests at any test point at which the data are intended to be used in the calculation of the deterioration factor, the number of tests must be the same at each point and may not exceed three valid tests. Tests between test points may be conducted as required by the Administrator. Data from all tests (including voided tests) shall be air posted to the Administrator within 24 hours (or delivered within 3 working days). In addition, all test data shall be compiled and provided to the Administrator in accordance with § 86.078–23. Where the Administrator conducts a test on a durability-data vehicle at a prescribed test point, the results of that test will be used in the calculation of the deterioration factor.

(ii) The results of all emission tests shall be rounded, using the "Rounding Off Method" specified in ASTM E29–67, to the number of places to the right of the decimal point indicated by expressing the applicable emission standards of this subpart to three significant figures.

(7) Whenever the manufacturer proposes to operate and test a vehicle which may be used for emission or durability data, he shall provide the zero-mile test data to the Administrator (except for those vehicles for which the zero-mile test requirement has been waived under § 86.078–23(a)(2)) and make the vehicle available for such testing under § 86.078–29 as the Administrator may require before beginning to accumulate mileage on the vehicle. Failure to comply with this requirement will invalidate all test data submitted for this vehicle.

(8) Once a manufacturer begins to operate an emission-data or durability-data vehicle, as indicated by compliance with paragraph (a)(7) of this section, he shall continue to run the vehicle to 4,000 miles or 50,000 miles, respectively, and the data from the vehicle will be used in the calculations under § 86.078–28. Discontinuation of a vehicle shall be allowed only with the written consent of the Administrator.

(9)(i) The Administrator may elect to operate and test any test vehicle during all or any part of the mileage accumulation and testing procedure. In such cases, the manufacturer shall provide the vehicle(s) to the Administrator with all information necessary to conduct this testing.

(ii) The test procedures in §§ 86.106 through 86.145 will be followed by the Administrator. The Administrator will test the vehicles at each test point. Maintenance may be performed by the manufacturer under such conditions as the Administrator may prescribe.

(iii) The data developed by the Administrator for the engine-system combination shall be combined with any applicable data supplied by the manufacturer on other vehicles of that combination to determine the applicable deterioration factors for the combination. In the case of a significant discrepancy between data developed by the Administrator and that submitted by the manufacturer, the Administrator's data shall be used in the determination of deterioration factors.

(10) Emission testing of any type with respect to any certification vehicle other than that specified in this part is not allowed except as such testing may be specifically authorized by the Administrator.

(11) This section does not apply to testing conducted to meet the requirements of § 86.078–23(b)(2).

(b)(1) Paragraph (b) of this section applies to gasoline-fueled heavy-duty engines.

(2) The engine dynamometer service accumulation schedule will consist of several operating conditions which give the same percentage of time at various manifold vacuums and modes as specified in the emission test cycle. The average speed shall be between 1,650 and 1,700 r.p.m. Subject to the requirements as to average speed, there must be operation at speeds in excess of 3,200 r.p.m. (but not in excess of governed speed for governed engines or rated speed for nongoverned engines) for a cumulative maximum of 0.5 percent of the actual cycle time, excluding time in transient conditions. Maximum cycle time shall be 15 minutes. A cycle approved in advance by the Administrator shall be used.

(3) *Emission-data engines.* Unless as otherwise provided for in § 86.078–23(a), emission-data engines shall be operated and tested as follows: Each emission-data engine shall be operated for 125 hours with all emission control systems installed and operating. Emission tests shall be conducted at zero and 125 hours. Evaporative emission controls need not be connected provided normal operating conditions are maintained in the engine induction system.

(4) *Durability-data engines.* Unless as otherwise provided for in § 86.078–23(a), durability-data engines shall be operated and tested as follows: Each durability-data engine shall be operated with all emission control systems installed and operating, for 1,500 hours. Emission tests shall be conducted at zero hours and at each 125-hour interval. Evaporative emission controls need not be connected provided normal operating conditions are maintained in the engine induction system.

(5) All tests required by this subpart to be conducted after 125 hours of operation or at any multiple of 125 hours may be conducted at any accumulated number of hours within 8 hours of 125 hours or the appropriate multiple of 125 hours, respectively.

(6)(i) The results of each emission test shall be supplied to the Administrator within 72 hours (or delivered within 5 working days). The manufacturer shall furnish to the Administrator an explanation for voiding any test. The Administrator will determine if voiding the test was appropriate based upon the explanation given by the manufacturer for the voided test. If a manufacturer conducts multiple tests at any test point at which the data are intended to be used in the calculation of the deterioration factor, the number of tests must be the same at each point and may not exceed three valid tests. Tests between test points may be conducted as required by the Administrator. Data from all tests (including voided tests) shall be air posted to the Administrator within 72 hours (or delivered within 5 working days). In addition, all test data shall be compiled and provided to the Administrator in accordance with § 86.078–23. Where the Administrator conducts a test on a durability-data engine at a prescribed test point, the results of that test will be used in the calculation of the deterioration factor.

(ii) The results of all emission tests shall be recorded and reported to the Administrator using two places to the right of the decimal point. These numbers shall be rounded in accordance with the "Rounding Off Method" specified in ASTM E29–67.

(7) Whenever the manufacturer proposes to operate and test an engine which may be used for emission or durability data, he shall provide the zero-hour test data to the Administrator (except for those engines for which the zero-hour test requirement has been waived under § 86.078–23(a)(2)) and make the engine available for such testing under § 86.078–29 as the Administrator may require, before beginning to accumulate hours on the engine. Failure to comply with this requirement will invalidate all test data later submitted for this engine.

(8) Once a manufacturer begins to operate an emission-data or durability-data engine, as indicated by compliance with paragraph (b)(7) of this section,

he shall continue to run the engine to 125 hours or 1,500 hours, respectively, and the data from the engine will be used in the calculations under § 86.078–28. Discontinuation of an engine shall be allowed only with the prior written consent of the Administrator.

(9) (i) The Administrator may elect to operate and test any test engine during all or any part of the service accumulation and testing procedure. In such cases the manufacturer shall provide the engine(s) to the Administrator with all information necessary to conduct the testing.

(ii) The test procedures (§§ 86.777–5 through 86.777–15) will be followed by the Administrator. The Administrator will test the engines at each test point. Maintenance may be performed by the manufacturer under such conditions as the Administrator may prescribe.

(iii) The data developed by the Administrator for the engine-system combination shall be combined with any applicable data supplied by the manufacturer on other engines of that combination to determine the applicable deterioration factors for the combination. In the case of a significant discrepancy between data developed by the Administrator and that submitted by the manufacturer, the Administrator's data shall be used in the determination of deterioration factors.

(10) Emission testing of any type with respect to any certification engine other than that specified in this subpart is not allowed except as such testing may be specifically authorized by the Administrator.

(c) (1) Paragraph (c) of this section applies to Diesel heavy-duty engines.

(2) The procedures set forth in this section describe the service accumulation that shall be accomplished on each test engine and when tests are to be conducted.

(3) (i) *Emission-data engines.* Unless as otherwise provided for in § 86.078–23 (a), emission-data engines shall be operated and tested as follows: Each emission-data engine shall be operated for 125 hours with all emission control systems installed and operating. Emission tests shall be conducted at zero and 125 hours.

(ii) *Durability-data engines.* Unless as otherwise provided for in § 86.078–23(a), durability-data engines shall be operated and tested as follows: Each durability-data engine shall be operated, with all emission control systems installed and operating, for 1,000 hours. Emission tests shall be conducted at zero hours and at each 125-hour interval.

(4) A break-in procedure, not to exceed 20 hours, may be run if approved in writing in advance by the Administrator. This procedure would be run after the zero-hour test, and the hours accumulated would not be counted as part of the service accumulation.

(5) Before service accumulation can begin, the following criteria must be met. Failure to comply with these requirements shall invalidate all test data submitted for an engine.

(i) Each engine shall produce at least 95 percent of the maximum horsepower, corrected to rating conditions, at 95 to 100 percent of the rated speed.

(ii) The fuel rate at maximum horsepower shall be within manufacturer's specifications.

(iii) The zero-hour test data shall be provided to the Administrator (except for those engines for which the zero-hour test requirement has been waived under § 86.078–23(a)(2)) and the engine shall be made available for such testing under § 86.078–29 as the Administrator may require.

(6) During service accumulation, hours can be credited toward the required service accumulation hours when the following criteria are met. If these criteria cannot be met, engine operation shall be discontinued and the Administrator shall be notified immediately. (Adjustments to the fuel rate can be approved under the provisions of § 86.078–25).

(i) Each engine shall produce at least 95 percent of the maximum horsepower, at 95 to 100 percent of the rated speed, observed during zero-hour testing. Horsepower values shall be corrected to the rating conditions.

(ii) The engine shall be operated at 75 percent of the inlet and exhaust restrictions specified in § 86.877–8 except that the tolerance will be ±3 inches of water and ±0.5 inches of Hg, respectively.

(7) During each emission test the inlet and exhaust restrictions shall be as specified § 86.877–8.

(8) Tests, other than zero-hour tests, may be conducted within 8 hours of the nominal test point.

(9) (i) The results of each emission test shall be air posted to the Administrator within 72 hours of test completion (or delivered within 5 working days). The manufacturer shall furnish to the Administrator an explanation for voiding any test. The Administrator will determine if voiding the test was appropriate based upon the explanation given by the manufacturer for the voided tests. If a manufacturer conducts multiple tests (not to exceed three valid tests) at any test point, the number of tests must be the same at each point. The data obtained from all valid tests shall be used in the calculation of the deterioration factor. Tests between test points may be conducted as required by the Administrator. Data from all tests (including voided tests) shall be air posted to the Administrator within 72 hours (or delivered within 5 working days). In addition, all test data shall be compiled and provided to the Administrator in accordance with § 86.078–23. Where the Administrator conducts a test on a durability-data engine at a prescribed test point, the results of that test will be used in the calculation of the deterioration factor.

(ii) The results of all emission tests shall be recorded and reported to the Administrator using two places to the right of the decimal point. These numbers shall be rounded in accordance with the "Rounding Off Method" specified in ASTM E29–67.

(10) Once a manufacturer begins to operate an emission-data or durability-data engine, as indicated by compliance with paragraph (c) of this section, he shall continue to run the engine to 125 hours or 1,000 hours respectively, and the data from the engine shall be used in the calculations under § 86.078–28. Discontinuation of an engine shall be allowed only with the prior written consent of the Administrator.

(11) (i) The Administrator may elect to operate and test any test engine during all or any part of the service accumulation and testing procedure. In such cases, the manufacturer shall provide the engine(s) to the Administrator with all information necessary to conduct the testing.

(ii) The test procedures (§§ 86.877–5 through 86.877–14 and §§ 86.977–5 through 86.977–15) will be followed by the Administrator. The Administrator will test the engines at each test point. Maintenance may be performed by the manufacturer under such conditions as the Administrator may prescribe.

(iii) The data developed by the Administrator for the engine-system combination shall be combined with any applicable data supplied by the manufacturer on other engines of that combination to determine the applicable deterioration factors for the combination. In the case of a significant discrepancy between data developed by the Administrator and that submitted by the manufacturer, the Administrator's data shall be used in the determination of deterioration factors.

(12) Emission testing of any type with respect to any certification engine other than that specified in this part is not allowed except as such testing may be specifically authorized by the Administrator.

§ 86.078–27 Special test procedures.

(a) For light-duty vehicles or light-duty trucks, the Administrator may, on the basis or a written application therefore by a manufacturer, prescribe test procedures other than those set forth in this part for any motor vehicle which he determines is not susceptible to satisfactory testing by the procedures set forth in Subpart B.

(b) For heavy-duty engines, the Administrator may prescribe test procedures other than those set forth in this part for any motor vehicle engine which he determines is not susceptible to satisfactory testing by the procedures set forth in Subparts H, I, or J.

§ 86.078–28 Compliance with emission standards.

(a) (1) Paragraph (a) of this section applies to light-duty vehicles and light-duty trucks.

(2) The applicable exhaust and fuel evaporative emission standards of this subpart apply to the emissions of vehicles for their useful life.

(3) Since it is expected that emission control efficiency will change with mileage accumulation on the vehicle, the emission level of a vehicle which has accumulated 50,000 miles will be used as

the basis for determining compliance with the standards.

(4) The procedure for determining compliance of a new motor vehicle with exhaust emission standards is as follows.

(i) Separate emission deterioration factors shall be determined from the exhaust emission results of the durability-data vehicle(s) for each engine-system combination. A separate factor shall be established for exhaust HC, exhaust CO, and exhaust NOx for each engine-system combination. A separate evaporative emission deterioration factor shall be determined for each evaporative emission family-evaporative emission control system combination from the testing conducted by the manufacturer.

(A) The applicable results to be used in determining the exhaust emission deterioration factors for each engine-system combination shall be:

(*1*) All valid exhaust emission data from the tests required under § 86.078–26(a)(4), except the zero-mile tests. This shall include the official test results, as determined in § 86.078–29 for all tests conducted on all durability-data vehicles of the combination selected under § 86.078–24(c) (including all vehicles elected to be operated by the manufacturer under § 86.078–24(c)(1)(ii)).

(2) All exhaust emission data from the tests conducted before and after the scheduled maintenance provided in § 86.078–25.

(3) All exhaust emission data from tests required by maintenance approved under § 86.078–25, in those cases where the Administrator conditioned his approval for the performance of such maintenance on the inclusion of such data in the deterioration factor calculation.

(B) All applicable exhaust emission results shall be plotted as a function of the mileage on the system, rounded to the nearest mile, and the best fit straight lines, fitted by the method of least squares, shall be drawn through all these data points. The interpolated 4,000- and 50,000-mile points on this line must be within the standards provided in § 86.078–8 or § 86.078–9, as applicable, or the data will not be acceptable for use in calculation of a deterioration factor, unless no applicable data point exceeded the standard. An exhaust emission deterioration factor shall be calculated for each engine-system combination as follows:

factor=Exhaust emissions interpolated to 50,000 miles divided by exhaust emissions interpolated to 4,000 miles.

These interpolated values shall be carried out to a minimum of four places to the right of the decimal point before dividing one by the other to determine the deterioration factor. The results shall be rounded to three places to the right of the decimal point in accordance with ASTM E 29–67.

(C) An evaporative emissions deterioration factor shall be determined from the testing conducted as described in § 86.078–21(b)(4)(ii), for each evaporative emission family-evaporative emission control system combination to indicate the evaporative emission level at 50,000 miles relative to the evaporative emission level at 4,000 miles as follows:

factor=Evaporative emission level at 50,000 miles minus the evaporative emission level at 4,000 miles.

The factor shall be established to a minimum of two places to the right of the decimal.

(ii)(A) The official exhaust-emission test results for each emission data vehicle at the 4,000-mile test point shall be multiplied by the appropriate deterioration factor: *Provided*, That if a deterioration factor as computed in paragraph (a)(4)(i)(B) of this section is less than one, that deterioration factor shall be one for the purposes of this paragraph.

(B) The official evaporative emission test results for each evaporative emission-data vehicle at the 4000-mile test point shall be adjusted by addition of the appropriate deterioration factor: *Provided*, That if a deterioration factor as computed in paragraph (a)(4)(i)(c) of this section is less than zero, that deterioration factor shall be zero for the purposes of this paragraph.

(iii) The emissions to compare with the standard shall be the adjusted emissions of paragraphs (a)(4)(ii)(A) and (B) of this section for each emission-data vehicle. Before any emission value is compared with the standard, it shall be rounded, in accordance with ASTM E 29–67, to two significant figures. The rounded emission values may not exceed the standard.

(iv) Before any engine family-evaporative emission family combination may be certified, every test vehicle selected under § 85.078–24(b)(1)(ii) through (b)(1)(v) to represent that engine family must comply with all exhaust emission standards for which it was tested (as determined in paragraph (a)(4)(iii) of this section) and every test vehicle selected under § 86.078–24(b)(1)(vii) to represent that evaporative emission family must comply with all exhaust and evaporative emission standards for which it was tested (as determined in paragraph (a)(4)(iii) of this section).

(v) [delete]

(b)(1) Paragraph (b) of this section applies to gasoline-fueled heavy-duty engines.

(2) The exhaust emission standards in § 86.078–10 apply to the emissions of engines for their useful life.

(3) Since emission control efficiency decreases with the accumulation of hours on the engine, the emission level of an engine which has accumulated 1,500 hours of dynamometer operation will be used as the basis for determining compliance with the standards.

(4) The procedure for determining compliance of a new engine with exhaust emission standards is as follows:

(i) Separate emission deterioration factors shall be determined from the emission results of the durability-data engines for each engine-system combination. Separate factors shall be established for CO and for the combined emissions of HC and NOx.

(A) The applicable results to be used in determining the deterioration factors for each combination shall be:

(*1*) All valid emission data from the tests required under § 86.078–26(b)(4), except the zero-hour tests. This shall include the official test results, as determined in § 86.078–29, for all tests conducted on all durability-data engines of the combination selected under § 86.078–24(c)(2) (including all engines elected to be operated by the manufacturer under § 86.078–24(c)(2)(iii)).

(2) All emission data from the test conducted before and after maintenance provided in § 86.078–25(c)(2)(i)(A).

(3) All emission data from the test conducted before and after maintenance provided in § 86.078–25(c)(2)(v)(C) if emission tests were conducted.

(B) All applicable emission results for (*1*) HC+NOx and (2) CO shall be plotted as a function of durability hours which shall be consistently rounded to the nearest hour. Emission data shall have two figures to the right of the decimal. The best fit straight lines ((*1*) HC+NOx and (2) CO), fitted by the method of least squares, shall be drawn through these data points. The interpolated 125-hour and 1500-hour points on each line, rounded to whole numbers in accordance with ASTM E 29–67, must be within the standards specified in § 86.078–10 or the data shall not be used in the calculation of a deterioration factor, unless no applicable data points exceed the standards.

(C) The interpolated values shall be used to calculate a deterioration factor as follows:

Factor=Exhaust emissions interpolated to 1500 hours minus the exhaust emissions interpolated to 125 hours. (Negative deterioration factors shall be considered zero.)

(ii) The appropriate deterioration factor, carried out to two places to the right of the decimal point, shall be added to the exhaust emission test results, carried out to two places to the right of the decimal point, for each emission-data engine.

(iii) The emission values to compare with the standards shall be the adjusted emission values of paragraph (b)(4)(ii) of this section rounded to whole numbers in accordance with ASTM E 29–67 for each emission-data engine.

(iv) Every test engine of an engine family must comply with all applicable standards, as determined in paragraph (b)(4)(iii) of this section, before any engine in that family will be certified.

(c)(1) Paragraph (c) of this section applies to Diesel heavy-duty engines.

(2) The emission standards in § 86.078–11 apply to the emissions of engines for their useful lives.

(3) Since emission control efficiency decreases with accumulation of hours on the engine, the emission level of an engine which has accumulated 1,000 hours of dynamometer operation will be used as the basis for determining compliance with the standards.

(4) The procedure for determining compliance with emission standards for Diesel heavy-duty engines is as follows:

(i) Emission deterioration factors for the acceleration mode (designated as "A"), the lugging mode (designated as "B"), the peak opacity (designated as "C"), the CO exhaust emissions, and the HC+NOx exhaust emissions shall be established separately for each engine-system combination.

(A) The applicable results to be used in determining the deterioration factors for each combination shall be:

(*1*) All emission data from the tests required under § 86.078–26(c)(3)(ii), except the zero-hour tests. This shall include the official test results, as determined in § 86.078–29, for all tests conducted on all durability-data engines of the combination selected under § 86.078–24(c)(3)(i) (including all engines elected to be operated by the manufacturer under § 86.078–24(c)(3)(ii)).

(*2*) All emission data from the tests conducted before and after the maintenance provided in § 86.078–25(d)(2)(i)(A) if emission tests were conducted.

(*3*) All emission data from the tests conducted before and after maintenance provided in § 86.078–25(d)(2)(v)(C) if emission tests were conducted.

(B) All applicable emission results for (1) HC+NOx, (2) CO, (3) acceleration smoke ("a"), (4) lugging smoke ("b"), and (5) peak smoke ("c") shall be plotted as a function of durability hours which shall be consistently rounded to the nearest hour. Emission data shall have two figures to the right of the decimal. The best fit straight lines, fitted by the method of least squares, shall be drawn through these data points. The interpolated 125- and 1000-hour points on each line, rounded to whole numbers in accordance with ASTM E 29–67, must be within the standards specified in § 86.078–11 or the data shall not be used in the calculation of the deterioration factor, unless no applicable data points exceeded the standards.

(C) The interpolated values shall be used to calculate a deterioration factor as follows:

Factor=Exhaust emissions (both smoke and gaseous) interpolated to 1000 hours minus the exhaust emissions interpolated to 125 hours. (Negative deterioration factors shall be considered zero).

(ii) The appropriate deterioration factor, carried out to two places to the right of the decimal point, shall be added to the exhaust emission test results, carried out to two places to the right of the decimal point, for each emission-data engine.

(iii) The emission values to compare with the standards shall be the adjusted emission values of paragraph (c)(4)(ii) of this section rounded to whole numbers in accordance with ASTM E 29–67 for each emission-data engine.

(iv) Every test engine of an engine family must comply with all applicable standards, as determined in paragraph (c)(4)(iii) of this section, before any engine in that family will be certified.

§ 86.078–29 Testing by the Administrator.

(a)(1) Paragraph (a) of this section applies to light-duty vehicles and light-duty trucks.

(2) The Administrator may require that any one or more of the test vehicles be submitted to him, at such place or places as he may designate, for the purposes of conducting emissions tests. The Administrator may specify that he will conduct such testing at the manufacturer's facility, in which case instrumentation and equipment specified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(3)(i) Whenever the Administrator conducts a test on a test vehicle, the results of that test shall, unless subsequently invalidated by the Administrator, comprise the official data for the vehicle at the prescribed test point and the manufacturer's data for that prescribed test point shall not be used in determining compliance with emission standards.

(ii) Whenever the Administrator does not conduct a test on a test vehicle at a test point, the manufacturer's test data will be accepted as the official data for that test point: *Provided*, That if the Administrator makes a determination based on testing under paragraph (a)(2) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer, *And Further Provided*, That if the Administrator has reasonable basis to believe that any test data submitted by the manufacturer is not accurate or has been obtained in violation of any provisions of this part, the Administrator may refuse to accept that data as the official data pending retesting or submission or further information. If the manufacturer conducts more than one test on a vehicle, as authorized under § 86.078–26(a)(3)(i)(A), the data from the last test in that series of tests on that vehicle, will constitute the official data.

(iii)(A) The emission-data vehicle presented to the Administrator for testing shall be calibrated within the production tolerances applicable to the manufacturer's specifications to be shown on the vehicle label (see § 86.078–35(a)(1)(iii)(D)) as specified in the application for certification. If the Administrator determines that a vehicle is not within such tolerances, the vehicle shall be adjusted, at the facility designated by the Administrator, prior to the test and an engineering report shall be submitted to the Administrator describing the corrective action taken. Based on the engineering report, the Administrator will determine if the vehicle shall be used as an emission-data vehicle.

(B) If the Administrator determines that the test data developed on an emission-data vehicle under paragraph (a)(3)(i) of this section would cause that vehicle to fail due to excessive 4000 mile emissions or by application of the appropriate deterioration factor, then the following procedure shall be observed:

(*1*) The manufacturer may request a retest. Before the retest, the vehicle may be readjusted to manufacturer's specifications, if these adjustments were made incorrectly prior to the first test, and other maintenance or repairs may be performed in accordance with § 86.078–25. All work on the vehicle shall be done at such location and under such conditions as the Administrator may prescribe.

(*2*) The vehicle will be retested by the Administrator and the results of this test shall comprise the official data for the emission-data vehicle.

(iv) If sufficient durability data are not available at the time of any emission test conducted under paragraph (a)(2) of this section to enable the Administrator to determine whether an emission-data vehicle would fail, the manufacturer may request a retest in accordance with the provisions of paragraphs (a)(3)(iii)(A) and (B) of this section. If the manufacturer does not promptly make such request, he shall be deemed to have waived the right to a retest. A request for retest must be made before the manufacturer removes the vehicle from the test premises.

(b)(1) Paragraph (b) of this section applies to heavy-duty engines.

(2) The Administrator may require that any one or more of the test engines be submitted to him, at such place or places as he may designate, for the purpose of conducting emissions tests. The Administrator may specify that he will conduct such testing at the manufacturer's facility, in which case instrumentation and equipment specified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(3)(i) Whenever the Administrator conducts a test on a test engine the results of that test, unless subsequently invalidated by the Administrator, shall comprise the official data for the engine at that prescribed test point and the manufacturer's data for that prescribed test point shall not be used in determining compliance with emission standards.

(ii) Whenever the Administrator does not conduct a test on a test engine at a test point, the manufacturer's test data will be accepted as the official data for that test point. *Provided*, That if the Administrator makes a determination based on testing under paragraph (b)(2) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by

the manufacturer, *And Further Provided*, That if the Administrator has reasonable basis to believe that any test data submitted by the manufacturer is not accurate or has been obtained in violation of any provision of this part, the Administrator may refuse to accept that data as the official data pending retesting or submission of further information.

(iii) (A) The emission-data engine presented to the Administrator for testing shall be calibrated within the production tolerances applicable to the manufacturer's specifications to be shown on the engine label (see § 86.078–35(a)(2)(iii)) as specified in the application for certification. If the Administrator determines that an engine is not within such tolerances, the engine shall be adjusted at the facility designated by the Administrator prior to the test and an engineering report shall be submitted to the Administrator describing the corrective action taken. Based on the engineering report the Administrator will determine if the engine shall be used as an emission-data engine.

(B) If the Administrator determines that the test data developed under paragraph (b)(3)(iii)(A) of this section would cause the emission-data engine to fail due to excessive 125-hour emission values or by the application of the appropriate deterioration factor, then the following procedure shall be observed.

(*1*) The manufacturer may request a retest. Before the retest, the engine may be readjusted to manufacturer's specifications, if these adjustments were made incorrectly prior to the first test, and other maintenance or repairs may be performed in accordance with § 86.078–25. All work on the engine shall be done at such location and under such conditions as the Administrator may prescribe.

(*2*) The engine will be retested by the Administrator and the results of this test shall comprise the official data for the emission-data engine.

(iv) If sufficient durability data are not available at the time of any emission test conducted under paragraph (b)(2) of this section to enable the Administrator to determine whether an emission-data engine would fail, the manufacturer may request a retest in accordance with the provisions of paragraphs (b)(3)(iii)(B)(*1*) and (*2*) of this section. If the manufacturer does not promptly make such request, he shall be deemed to have waived the right to a retest. A request for retest must be made before the manufacturer removes the engine from the test premises.

§ 86.078–30 Certification.

(a)(1) If, after a review of the test reports and data submitted by the manufacturer, data derived from any inspection carried out under § 86.078–7(c) and any other pertinent data or information, the Administrator determines that a test vehicle(s) (or test engine(s)) meets the requirements of the Act and of this subpart, he will issue a certificate of conformity with respect to such vehicle(s) (or engine(s)) except in cases covered by paragraph (c) of this section. If applicable, the certificate will state which vehicles are certified for sale at high altitude.

(2) Such certificate will be issued for such period not to exceed one model year as the Administrator may determine and upon such terms as he may deem necessary to assure that any new motor vehicle (or new motor vehicle engine) covered by the certificate will meet the requirements of the Act and of this part. Each such certificate shall contain the following language:

This certificate covers only those new motor vehicles (or new motor vehicle engines) which conform, in all material respects, to the design specifications that applied to those vehicles (or engines) described in the application for certification and which are produced during the ---- model year production period of the said manufacturer, as defined in 40 CFR § 86.078–2.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR § 86.078–7(c) which concern either the vehicle (or engine) certified, or any production vehicle (or production engine) covered by this certificate, or any production vehicle (or production engine) which when completed will be claimed to be covered by this certificate. Failure to comply with all the requirements of § 86.078–7(c) with respect to any such vehicle (or engine) may lead to revocation or suspension of this certificate as specified in 40 CFR § 86.078–30(c). It is also a term of this certificate that this certificate may be revoked or suspended for the other reasons stated in § 86.078–30 (c) or (d).

(3) One such certificate will be issued for each engine family and will certify compliance with no more than one set of applicable standards except that for gasoline-fueled light-duty vehicles and light-duty trucks, one such certificate will be issued for each engine family-evaporative emission family combination and will certify compliance with no more than one set of applicable standards.

(4) A violation of section 203(a)(1) of the Clean Air Act occurs when any manufacturer sells, offers for sale, introduces or delivers for introduction into commerce, any light-duty vehicle or light-duty truck, subject to the regulations under the Act, which is not covered by a certificate of conformity at high altitude issued under this part:

(i) At a designated high-altitude location, unless such manufacturer has substantial reason to believe that such motor vehicle will not be sold to an ultimate purchaser for principal use at a designated high-altitude location; or,

(ii) At an other than designated high-altitude location, when such manufacturer has reason to believe that such motor vehicle is intended by the ultimate purchaser to be used principally at a designated high-altitude location.

(5) For the purpose of paragraph (a) of this section, "designated high-altitude location" is any county which has substantially all of its area located above 1219 meters (4,000 feet) and which is identified below.

COUNTIES LOCATED SUBSTANTIALLY ABOVE 1,219 METERS (4,000 FEET) IN ELEVATION

STATE OF ARIZONA	
Apache	Navajo
STATE OF COLORADO	
Adams	Jefferson
Alamosa	Lake
Arapahoe	La Plata
Archuleta	Larimer
Boulder	Las Animas
Chaffee	Lincoln
Clear Creek	Mesa
Conejos	Mineral
Costilla	Moffat
Crowley	Montezuma
Custer	Montrose
Dolores	Morgan
Delta	Ouray
Denver	Park
Douglas	Pitkin
Eagle	Pueblo
Elbert	Rio Blanco
El Paso	Rio Grande
Fremont	Routt
Garfield	Saguache
Gilpin	San Juan
Grand	San Miguel
Gunnison	Summit
Hinsdale	Teller
Huerfano	Washington
Jackson	Weld
STATE OF IDAHO	
Bannock	Custer
Bear Lake	Franklin
Bingham	Fremont
Blaine	Jefferson
Bonneville	Madison
Butte	Minidoka
Camas	Oneida
Caribou	Power
Cassia	Teton
Clark	Valley
STATE OF MONTANA	
Beaverhead	Madison
Deer Lodge	Meagher
Gallatin	Park
Jefferson	Silver Bow
STATE OF NEBRASKA	
Banner	Sioux
Kimball	
STATE OF NEVADA	
Carson City	Lander
Douglas	Lyon
Elko	Mineral
Esmeralda	Storey
Eureka	White Pine
Humboldt	
STATE OF NEW MEXICO	
Bernalillo	Mora
Catron	Rio Arriba
Colfax	Sandoval
Curry	San Juan
De Baca	San Miguel
Grant	Santa Fe
Guadalupe	Sierra
Lincoln	Socorro
Harding	Taos
Lincoln	Torrance
Los Alamos	Union
Luna	Valencia
McKinley	
STATE OF OREGON	
Lake	

STATE OF UTAH

Beaver	Piute
Box Elder	Rich
Cache	Salt Lake
Carbon	San Juan
Daggett	Sanpete
Davis	Sevier
Duchesne	Summit
Emery	Tooele
Grand	Uintah
Iron	Utah
Juab	Wasatch
Kane	Wayne
Millard	Weber
Morgan	

STATE OF WYOMING

Albany	Natrona
Carbon	Niobrara
Converse	Park
Fremont	Platte
Goshen	Sublette
Hot Springs	Sweetwater
Johnson	Teton
Laramie	Uinta
Lincoln	Weston

(6) The provisions of paragraph (a)(4) of this section shall not apply to any light-duty vehicle or light-duty truck, sold, offered for sale, introduced, or delivered for introduction into commerce in California, provided that the vehicle is covered by a certificate of conformity with emission standards in effect in California.

(7) Certificates issued for light-duty vehicles or light-duty trucks certified with catalytic converters shall be subject to the following term in addition to the term in paragraph (a)(2) of this section: "Catalyst-equipped vehicles, otherwise covered by this certificate, which are driven outside the United States, Canada, and Mexico will be presumed to have been operated on leaded gasoline resulting in deactivation of the catalysts. If these vehicles are imported or offered for importation without retrofit of the catalyst, they will be considered not to be within the coverage of this certificate unless included in a catalyst control program operated by a manufacturer or a United States Government Agency and approved by the Administrator."

(b)(1) The Administrator will determine whether a vehicle (or engine) covered by the application complies with applicable standards by observing the following relationships:

(i) *Light-duty vehicles and light-duty trucks.*

(A) The durability-data vehicle(s) selected under § 86.078–24 (c)(1)(i) shall represent all vehicles of the same engine-system combination.

(B) The emission-data vehicle(s) selected under § 86.078–24 (b)(1)(ii), (b)(1)(iii), and (b)(1)(iv) shall represent all vehicles of the same engine-system combination as applicable to be sold below 4000 ft.

(C) The emission-data vehicle(s) selected under § 86.078–24 (b)(1)(vii)(A) and (b)(1)(vii)(B) shall represent all vehicles of the same evaporative control system within the evaporative family, as applicable, to be sold below 4000 ft.

(D) The emission-data vehicle(s) selected under § 86.078–24(b)(1)(v) shall represent all vehicles of the same engine-system combination to be sold at high altitude.

(E) The emission-data vehicle(s) selected under § 86.078–24(b)(1)(vii)(D) shall represent all vehicles of the same evaporative control system within the evaporative family sold at high altitude.

(ii) *Gasoline-fueled heavy-duty engines.*

(A) A test engine selected under § 86.078–24(b)(2)(ii) and (iv) shall represent all engines in the same engine family of the same engine displacement-exhaust emission control system combination.

(B) A test engine selected under § 86.078–24(b)(2)(iii) shall represent all engines in the same engine family of the same engine displacement-exhaust emission control system combination.

(C) A test engine selected under § 86.078–24(c)(2)(i) shall represent all engines of the same engine-system combination.

(iii) *Diesel heavy-duty engines.*

(A) A test engine selected under § 86.078–24(b)(3)(ii) shall represent all engines in the same engine-system combination.

(B) A test engine selected under § 86.078–24(b)(3)(iii) shall represent all engines of that emission control system at the rated fuel delivery of the test engine.

(C) A test engine selected under § 86.078–24(c)(3)(i) shall represent all engines of the same engine-system combination.

(2) The Administrator will proceed as in paragraph (a) of this section with respect to the vehicles (or engines) belonging to an engine family or engine family-evaporative emission family combination (as applicable), all of which comply with all applicable standards.

(3) If, after a review of the test reports and data submitted by the manufacturer, data derived from any additional testing conducted pursuant to § 86.078–29, data or information derived from any inspection carried out under § 86.078–7(c) or any other pertinent data or information, the Administrator determines that one or more test vehicles (or test engines) of the certification test fleet do not meet applicable standards, he will notify the manufacturer in writing, setting forth the basis for his determination. Within 30 days following receipt of the notification, the manufacturer may request a hearing on the Administrator's determination. The request shall be in writing, signed by an authorized representative of the manufacturer and shall include a statement specifying the manufacturer's objections to the Administrator's determination and data in support of such objections. If, after a review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 86.078–6 with respect to such issue.

(4) For light-duty vehicles and light-duty trucks the manufacturer may, at his option, proceed with any of the following alternatives with respect to an emission-data vehicle determined not in compliance with all applicable standards for which it was tested:

(i) Request a hearing under § 86.078–6; or

(ii) Remove the vehicle configuration (or evaporative vehicle configuration, as applicable) which failed, from his application;

(A) If the failed vehicle was tested for compliance with exhaust emission standards only: The Admfnistrator may select, in place of the failed vehicle, in accordance with the selection criteria employed in selecting the failed vehicle, a new emission-data vehicle to be tested for exhaust emission compliance only.

(B) If the failed vehicle was tested for compliance with both exhaust and evaporative emission standards: The Administrator may select, in place of the failed vehicle, in accordance with the selection criteria employed in selecting the failed vehicle, a new emission-data vehicle which will be tested for compliance with both exhaust and evaporative emission standards. If one vehicle cannot be selected in accordance with the selection criteria employed in selecting the failed vehicle, then two vehicles may be selected (i.e., one vehicle to satisfy the exhaust emission vehicle selection criteria and one vehicle to satisfy the evaporative emission vehicle selection criteria). The vehicle selected to satisfy the exhaust emission vehicle selection criteria and one vehicle to satisfy the evaporative emission vehicle selection criteria). The vehicle selected to satisfy the exhaust emission vehicle selection criteria will be tested for compliance with exhaust emission standards only. The vehicle selected to satisfy the evaporative emission vehicle selection criteria will be tested for compliance with both exhaust and evaporative emission standards; or

(iii) Remove the vehicle configuration (or evaporative vehicle configuration, as applicable) which failed from his application and add a vehicle configuration(s) (or evaporative vehicle configuration(s), as applicable) not previously listed. The Administrator may require, if applicable, that the failed vehicle be modified to the new engine code (or evaporative emission code, as applicable) and demonstrate by testing that it meets applicable standards for which it was originally tested. In addition, the Administrator may select, in accordance with the vehicle selection criteria given in § 86.078–24(b), a new emission-data vehicle or vehicles. The vehicles selected to satisfy the exhaust emission vehicle selection criteria will be tested for compliance with exhaust emission standards only. The vehicles selected to satisfy the evaporative emission vehicle selection criteria will be tested for compliance with both exhaust and evaporative emission standards; or

(iv) Correct a component or system malfunction and show that with a correctly functioning system or component the failed vehicle meets applicable standards for which it was originally tested. The Administrator may require a new emission-data vehicle, of identical vehicle configuration (or evaporative vehicle configuration as applicable) to the failed

vehicle, to be operated and tested for compliance with the applicable standards for which the failed vehicle was originally tested.

(5) For heavy-duty engines the manufacturer may, at his option, proceed with any of the following alternatives with respect to any engine family represented by a test engine(s) determined not in compliance with applicable standards:

(i) Request a hearing under § 86.078–6; or

(ii) Delete from the application for certification the engines represented by the failing test engine. (Engines so deleted may be included in a later request for certification under § 86.078–32.) The Administrator will then select in place of each failing engine an alternate engine chosen in accordance with selection criteria employed in selecting the engine that failed; or

(iii) Modify the test engine and demonstrate by testing that it meets applicable standards. Another engine which is in all material respects the same as the first engine, as modified, shall then be operated and tested in accordance with applicable test procedures.

(6) If the manufacturer does not request a hearing or present the required data under paragraphs (b)(4) or (b)(5) (as applicable) of this section, the Administrator will deny certification.

(c)(1) Nothwithstanding the fact that any certification vehicle(s) (or certification engine(s)) may comply with other provisions of this subpart, the Administrator may withhold or deny the issuance of a certificate of conformity (or suspend or revoke any such certificate which has been issued) with respect to any such vehicle(s) (or engine(s)) if:

(i) The manufacturer submits false or incomplete information in his application for certification thereof;

(ii) The manufacturer renders inaccurate any test data which he submits pertaining thereto.

(iii) Any EPA Enforcement Officer is denied access on the terms specified in § 86.078–7(c) to any facility or portion thereof which contains any of the following:

(A) The vehicle (or engine);

(B) Any components used or considered for use in its modification or build up into a certification vehicle (or certification engine);

(C) Any production vehicle (or production engine) which is or will be claimed by the manufacturer to be covered by the certificate;

(D) Any step in the construction of a vehicle (or engine) described in (C) of this subdivision;

(E) Any records, documents, reports, or histories required by this part to be kept concerning any of the above.

(iv) Any EPA Enforcement Officer is denied "reasonable assistance" (as defined in § 86.078–7(c)) in examining any of the items listed in paragraph (c)(1)(iii) of this section.

(2) The sanctions of withholding, denying, revoking, or suspending of a certificate may be imposed for the reasons in paragraphs (c)(1)(i), (ii), (iii), or (iv) of this section only when the infraction is substantial.

(3) In any case in which a manufacturer knowingly submits false or inaccurate information or knowingly renders inaccurate or invalid any test data or commits any other fraudulent acts and such acts contribute substantially to the Administrator's decision to issue a certificate of conformity, the Administrator may deem such certificate void ab initio.

(4) In any case in which certification of a vehicle (or engine) is proposed to be withheld, denied, revoked, or suspended under paragraph (c)(1)(iii), or (c)(1)(iv) of this section, and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.078–7(c) in fact occurred, the manufacturer, if he wishes to contend that, even though the violation occurred, the vehicle (or engine) in question was not involved in the violation to a degree that would warrant withholding denial, revocation, or suspension of certification under either paragraph (c)(1)(iii) or (c)(1)(iv) of this section, shall have the burden of establishing that contention to the satisfaction of the Administrator.

(5) Any revocation or suspension of certification under paragraph (c)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.078–6 hereof.

(ii) Extend no further than to forbid the introduction into commerce of vehicles (or engines) previously covered by certification which are still in the hands of the manufacturer, except in cases of such fraud or other misconduct as makes certification invalid ab initio.

(6) The manufacturer may request in the form and manner specified in paragraph (b)(3) of this section that any determination made by the Administrator under paragraph (c)(1) of this section to withhold or deny certification be reviewed in a hearing conducted in accordance with § 86.078–6. If the Administrator finds, after a review of the request and supporting data, that the request raises a substantial factual issue he will grant the request with respect to such issue.

(d)(1) *For light-duty vehicles and light-duty trucks.* Notwithstanding the fact that any vehicle configuration or engine family may be covered by a valid outstanding certificate of conformity, the Administrator may suspend such outstanding certificate of conformity in whole or in part with respect to such vehicle configuration or engine family if:

(i) The manufacturer refuses to comply with the provisions of a test order issued by the Administrator pursuant to § 86.603; or

(ii) The manufacturer refuses to comply with any of the requirements of § 86.603; or

(iii) The manufacturer submits false or incomplete information in any report or information provided pursuant to the requirements of § 86.609; or

(iv) The manufacturer renders inaccurate any test data which he submits pursuant to § 86.609; or

(v) Any EPA Enforcement Officer is denied access to a facility on the terms specified in § 86.606.

(vi) Any EPA Enforcement Officer is denied the opportunity on the terms specified in § 86.606 to

(A) Monitor vehicle selection pursuant to § 86.607,

(B) Select vehicles for testing pursuant to § 86.607, or

(C) Monitor vehicle testing performed to satisfy any of the requirements of this part; or

(vii) Any EPA Enforcement Officer is denied "reasonable assistance" as defined in § 86.606 in examining any of the items listed in that section; or

(viii) The manufacturer refuses to comply with the requirements of §§ 86.604(a), 86.605, 86.607, 86.608, 86.610, or 86.611.

(2) The sanction of suspending a certificate may not be imposed for the reasons in paragraphs (d)(1)(i), (ii) or (viii) of this section where such refusal is caused by conditions and circumstances outside the control of the manufacturer which renders it impossible to comply with those requirements. Such conditions and circumstances shall include, but are not limited to, any uncontrollable factors which result in the temporary unavailability of equipment and personnel needed to conduct the required tests, such as equipment breakdown or failure or illness of personnel, but shall not include failure of the manufacturer to adequately plan for and provide the equipment and personnel needed to conduct the tests. The manufacturer will bear the burden of establishing the presence of the conditions and circumstances required by this paragraph.

(3) The sanctions of suspending a certificate may be imposed for the reasons in paragraphs (d)(1)(iii), (iv), (v), (vi), (vii) of this section only when the infraction is substantial.

(4) In any case in which a manufacturer knowingly submitted false or inaccurate information or knowingly rendered inaccurate any test data or committed any other fraudulent acts, and such acts contributed substantially to the Administrator's original decision not to suspend or revoke a certificate of conformity in whole or in part, the Administrator may deem such certificate void from the date of such fraudulent act.

(5) In any case in which certification of a vehicle is proposed to be suspended under paragraph (d)(1)(v), (d)(1)(vi), or (d)(1)(vii) of this section, and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.606 in fact occurred, the manufacturer, if he wishes to contend that, even though the violation occurred, the vehicle configuration or engine family in question was not involved in the violation to a degree that would warrent suspension of certification under either paragraph (d)(1)(v), (d)(1)(vi), or (d)(1)(vii) of this section.

shall have the burden of establishing that contention to the satisfaction of the Administrator.

(6) Any suspension of certification under paragraph (d)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.613 hereof and

(ii) Not apply to vehicles no longer in the hands of the manufacturer.

§ 86.078–31 Separate certification.

Where possible a manufacturer should include in a single application for certification all vehicles (or engines) for which certification is required. A manufacturer may, however, choose to apply separately for certification of part of his product line. The selection of test vehicles (or test engines) and the computation of test results will be determined separately for each application.

§ 86.078–32 Addition of a vehicle or engine after certification.

(a) If a manufacturer proposes to add to his product line a vehicle (or engine) of the same engine-system combination as vehicles (or engines) previously certified but which was not described in the application for certification when the test vehicle(s) (or test engine(s)) representing other vehicles (or engines) of that combination was certified, he shall notify the Administrator. Such notification shall be in advance of the addition unless the manufacturer elects to follow the procedure described in § 86.078–34.

This notification shall include a full description of the vehicle (or engine) to be added.

(b) The Administrator may require the manufacturer to perform such tests on the test vehicles(s) (or test engine(s)) representing the vehicle (or engine) to be added which would have been required if the vehicle (or engine) had been included in the original application for certification.

(c) If, after a review of the test reports and data submitted by the manufacturer, and data derived from any testing conducted under § 86.078–29, the Administrator determines that the test vehicle(s) or test engine(s) meets all applicable standards, the appropriate certificate will be amended accordingly. If the Administrator determines that the test vehicle(s) (or test engine(s)) does not meet applicable standards, he will proceed under § 86.078–30(b).

§ 86.078–33 Changes to a vehicle or engine covered by certification.

(a) The manufacturer shall notify the Administrator of any change in production vehicles (or production engines) in respect to any of the parameters listed in § 86.078–24(a)(3), § 86.078–24(b)(1)(iii), § 86.078–24(b)(2)(iii), or § 86.078–24(b)(3)(iii) as applicable, giving a full description of the change. Such notification shall be in advance of the change unless the manufacturer elects to follow the procedure described in § 86.078–34.

(b) Based upon the description of the change, and data derived from such testing as the Administrator may require or conduct, the Administrator will determine whether the vehicle (or engine), as modified, would still be covered by the certificate of conformity then in effect.

(c) If the Administrator determines that the outstanding certificate would cover the modified vehicles (or engines) he will notify the manufacturer in writing. Except as provided in § 86.078–34, the change may not be put into effect prior to the manufacturer's receiving this notification. If the Administrator determines that the modified vehicles (or engines) would not be covered by the certificate then in effect, the modified vehicles (or engines) shall be treated as additions to the product line subject to § 86.078–32.

§ 86.078–34 Alternative procedure for notification of additions and changes.

(a) A manufacturer may, in lieu of notifying the Administrator in advance of an addition of a vehicle (or engine) under § 86.078–32 or a change in a vehicle (or engine) under § 86.078–33, notify him concurrently with the making of the change if the manufacturer believes the addition or change will not require any testing under the appropriate section. Upon notification to the Administrator, the manufacturer may proceed to put the addition or change into effect.

(b) The manufacturer may continue to produce vehicles (or engines) as described in the notification to the Administrator for a maximum of 30 days, unless the Administrator grants an extension in writing. This period may be shortened by a notification in accordance with paragraph (c) of this section.

(c) If the Administrator determines, based upon a description of the addition or change, that no test data will be required, he will notify the manufacturer in writing of the acceptability of the addition or change. If the Administrator determines that test data will be required, he will notify the manufacturer to rescind the change within 5 days of receipt of the notification. The Administrator will then proceed as in § 86.078–32(b) and (c), or § 86.078–33(b) and (c) as appropriate.

(d) Election to produce vehicles (or engines) under this section will be deemed to be a consent to recall all vehicles (or engines) which the Administrator determines under § 86.078–32(c) do not meet applicable standards, and to cause such nonconformity to be remedied at no expense to the owner.

§ 86.078–35 Labeling.

(a) The manufacturer of any motor vehicle (or motor vehicle engine) subject to the applicable emission standards of this subpart, shall at the time of manufacture, affix a permanent legible label, of the type and in the manner described below, containing the information hereinafter provided, to all production models of such vehicles (or engines) available for sale to the public and covered by a certificate of conformity under § 86.078–30(a).

(1) *Light-duty vehicles and light-duty trucks.* (i) A permanent legible label shall be affixed in a readily visible position in the engine compartment.

(ii) The label shall be affixed by the vehicle manufacturer who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label. The label shall not be affixed to any equipment which is easily detached from such vehicle.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals, which shall be of a color that contrasts with the background of the label:

(A) The label heading: Vehicle Emission Control Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine displacement (in cubic inches), engine family identification and evaporative family identification.

(D) Engine tuneup specifications and adjustments, as recommended by the manufacturer in accordance with the altitude at which the vehicle is to be sold to the ultimate purchaser, including but not limited to idle speed(s), ignition timing, the idle air-fuel mixture setting procedure and value (e.g., idle CO, idle air-fuel ratio, idle speed drop), high idle speed, initial injection timing, and valve lash (as applicable) as well as other parameters deemed necessary by the manufacturer. These specifications should indicate the proper transmission position during tuneup and what accessories (e.g., air conditioner), if any, should be in operation;

(E) An unconditional statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations which apply to light-duty vehicles or light-duty trucks.

(F) The altitude at which the vehicle is intended for sale to the public as specified by a certificate of conformity under § 86.078–30.

(2) *Gasoline-fueled heavy-duty engines.* (i) A permanent legible label shall be affixed to the engine in a position in which it will be readily visible after installation in the vehicle.

(ii) The label shall be attached to an engine part necessary for normal engine operation and not normally requiring replacement during engine life.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals which shall be of a color that contrasts with the background of the label:

(A) The label heading: Engine Exhaust Emission Control Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine displacement (in cubic inches) and engine family identification;

(D) Date of engine manufacture (month and year);

(E) Engine tuneup specifications and adjustments as recommended by the

manufacturer, including idle speed, ignition timing, and the idle air-fuel mixture setting procedure and value (e.g., idle CO, idle air-fuel ratio, idle speed drop), and valve lash. These specifications should indicate the proper transmission position during tuneup and what accessories (e.g., air conditioner), if any, should be in operation;

(F) An unconditional statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations applicable to gasoline-fueled heavy-duty engines.

(iv) The label may be made up of one or more pieces provided that all pieces are permanently attached to the same engine part.

(3) *Diesel heavy-duty engines.* (i) A permanent legible label shall be affixed to the engine in a position in which it will be readily visible after installation in the vehicle.

(ii) The label shall be attached to an engine part necessary for normal engine operation and not normally requiring replacement during engine life.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals which shall be of a color that contrasts with the background of the label:

(A) The label heading: Engine Exhaust Emission Control Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine family identification and model;

(D) Date of engine manufacture (month and year);

(E) Engine specification:

Advertised hp. ____ at ____ r.p.m.
Fuel rate at advertised hp. ____ mm^3/stroke.
Valve lash ____ (inches).
Initial injection timing (if adjustable) ____.
(The information applicable to each engine is to be inserted on the appropriate line.)

(F) An unconditional statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations applicable to Diesel heavy-duty engines.

(iv) The label may be made up of one or more pieces provided that all pieces are permanently attached to the same engine or vehicle part as applicable.

(b) The provisions of this section shall not prevent a manufacturer from also reciting on the label that such vehicle (or engine) conforms to any applicable state emission standards for new motor vehicles (or new motor vehicle engines) or any other information that such manufacturer deems necessary for, or useful to, the proper operation and satisfactory maintenance of the vehicle (or engine).

(c) (1) The manufacturer of any light-duty vehicle or light-duty truck subject to the emission standards of this subpart shall, in addition and subsequent to setting forth those statements on the label required by the Department of Transportation (DOT) pursuant to 49 CFR 567.4, set forth, on the DOT label or on an additional label located in proximity to the DOT label and affixed as described in 49 CFR 567.4(b), the following information in the English language, lettered in block letters and numerals not less than three thirty-seconds of an inch high, of a color that contrasts with the background of the label:

(i) The Heading: "Vehicle Emission Control Information"

(ii) The Statement: "This Vehicle Conforms to U.S. EPA Regulations Applicable to 1978 Model Year New Motor Vehicles"

(iii) One of the following statements, as applicable, in letters and numerals not less than six thirty-seconds of an inch high and of a color that contrasts with the background of the label:

(A) For all vehicles certified as non-catalyst-equipped: "NON-CATALYST"

(B) For all vehicles certified as catalyst-equipped which are included in a manufacturer's catalyst control program for which approval has been given by the Administrator: "CATALYST—APPROVED FOR IMPORT"

(C) For all vehicles certified as catalyst-equipped which are not included in a manufacturer's catalyst control program for which prior approval has been given by the Administrator: "CATALYST"

(2) In lieu of selecting either of the labeling options of paragraph (c)(1) of this section, the manufacturer may add the information required by paragraph (c)(1)(iii) of this section to the label required by paragraph (a) of this section. The required information will be set forth in the manner prescribed by paragraph (c)(1)(iii).

§ 86.078–36 Submission of vehicle identification numbers.

(a) The manufacturer of any light-duty vehicle or light-duty truck covered by a certificate of conformity under § 86.078–30(a) shall, not later than 60 days after its manufacture, submit to the Administrator the vehicle identification number of such vehicle: *Provided*, That this requirement shall not apply with respect to any vehicle manufactured within any State, as defined in section 302(d) of the Act.

(b) The requirements of this section may be waived with respect to any manufacturer who provides information satisfactory to the Administrator which will enable the Administrator to identify those vehicles which are covered by a certificate of conformity.

§ 86.078–37 Production vehicles and engines.

(a) Any manufacturer obtaining certification under this part shall supply to the Administrator, upon his request, a reasonable number of production vehicles (or engines) selected by the Administrator which are representative of the engines, emission control systems, fuel systems, and transmissions offered and typical of production models available for sale under the certificate. These vehicles (or engines) shall be supplied for testing at such time and place and for such reasonable periods as the Administrator may require. Heavy-duty engines supplied under this paragraph may be required to be mounted in chassis and appropriately equipped for operation on a chassis dynamometer.

(b)(1) Any manufacturer of light-duty vehicles or light-duty trucks, obtaining certification under this part shall notify the Administrator, on a quarterly basis, of the number of vehicles domestically produced for sale in the United States and the number of vehicles produced and imported for sale in the United States during the preceding quarter. A manufacturer may elect to provide this information every 60 days instead of quarterly, to combine it with the notification required under § 86.078–36. The notification must be submitted 30 days after the close of the reporting period. The vehicle production information required shall be submitted as follows:

(i) Total production volume expressed in terms of units produced.

(ii) Model type production volume, expressed for each model type in terms of units produced and as a percentage of total production.

(iii) Base level production volume, expressed for each base level in terms of units produced and as a percentage of (A) the total production of its respective model type(s) and, (B) total production.

(iv) Vehicle configuration production volume, expressed for each vehicle configuration in terms of units produced, and as a percentage of the total production of its respective base level. In addition, each vehicle configuration shall be identified by its appropriate engine-system combination.

(2) All light-duty vehicles and light-duty trucks covered by a certificate of conformity under § 86.078–30(a) shall be adjusted by the manufacturer to the ignition or injection timing specification detailed in § 86.078–35(a)(1)(iii)(D).

(c) *Heavy-duty engines.* Any heavy-duty engine manufacturer obtaining certification under this part shall notify the Administrator, on a quarterly basis, of the number of engines of each engine family-engine displacement-exhaust emission control system-fuel system combination produced for sale in the United States during the preceding quarter.

(d) The following definitions apply to this section:

(1) "Model type" means a unique combination of car line, basic engine, and transmission class.

(2) "Base level" means a unique combination of basic engine, inertia weight, and transmission class.

(3) "Vehicle configuration" means a unique combination of basic engine, engine code, inertia weight, transmission configuration, and axle ratio within a base level.

§ 86.078–38 Maintenance instructions.

(a) The manufacturer shall furnish or cause to be furnished to the purchaser of each new motor vehicle (or motor vehicle engine) subject to the standards prescribed in §§ 86.078–8 through 86.078–11 as applicable, written instructions for the maintenance and use of the vehicle (or engine) by the purchaser as may be reasonable and necessary to assure the

proper functioning of emission control systems.

(1) Such instructions shall be provided for those vehicle and engine components listed in Appendix VI to this part (and for any other components) to the extent that maintenance of these components is necessary to assure the proper functioning of emission control systems.

(2) Such instructions shall be in clear, and to the extent practicable, nontechnical language.

(b) The maintenance instructions required by this section shall contain a general description of the documentation which the manufacturer will require from the ultimate purchaser or any subsequent purchaser as evidence of compliance with the instructions.

(c) For gasoline-fueled light-duty vehicles and light-duty trucks.

(1) Such instructions shall specify the performance of all scheduled maintenance performed by the manufacturer under §§ 86.078–25(a)(2) or 86.078–25(b)(2) as applicable, and shall explain the conditions under which EGR system and catalytic converter maintenance is to be performed (e.g., what type of warning device is being employed and whether the device is activated by component failure or the need for periodic maintenance).

(2) Such instructions shall indicate, for vehicles to be sold to ultimate purchasers at low altitude, what adjustments or modifications, if any, are necessary to allow the vehicle to meet emissions standards at high altitude. The maintenance instructions shall, if applicable, include a statement that the vehicle's emission control system was not designed for conversion to allow the vehicle to meet emissions standards when operated at high altitude.

(3) Such instructions shall indicate, for vehicles to be sold to ultimate purchasers at high altitude, what adjustments or modifications, if any, are necessary to allow the vehicle to meet emissions standards at low altitude. The maintenance instructions shall, if applicable, include a statement that the vehicle's emission control system was not designed for conversion to allow the vehicle to meet emissions standards when operated at low altitude.

(d) For Diesel light-duty vehicles and light-duty trucks.

(1) Such instructions shall indicate, for vehicles to be sold to ultimate purchasers at low altitude, what adjustments or modifications, if any, are necessary to allow the vehicle to meet emissions standards at low altitude. The maintenance instructions shall, if applicable, include a statement that the vehicle's emission control system was not designed for conversion to allow the vehicle to meet emissions standards when operated at high altitude.

(2) Such instructions shall indicate, for vehicles to be sold to ultimate purchasers at high altitude, what adjustments or modifications, if any, are necessary to allow the vehicle to meet emissions standards at low altitude. The maintenance instructions shall, if applicable, include a statement that the vehicle's emission control system was not designed for conversion to allow the vehicle to meet emissions standards when operated at low altitude.

(e) For gasoline-fueled heavy-duty engines, such instructions shall specify the performance of all scheduled maintenance performed by the manufacturer under § 86.078–25(c)(2). Scheduled maintenance in addition to that performed on the durability-data engine under § 86.078–25(d)(2) may be recommended for reasons such as to offset the effects of operating conditions which differ from the dynamometer durability cycle or to increase the life of the engine beyond 1500 hours (or the equivalent). The instructions may schedule maintenance on a calendar time basis and/or mileage basis in addition to the engine service time basis that was followed by the manufacturer under § 86.078–25(c)(2).

(f) For Diesel heavy-duty engines, such instructions shall specify the performance of all scheduled maintenance performed by the manufacturer under § 86.078–25(d)(2). Scheduled maintenance in addition to that performed on the durability-data engine under § 86.078–25(d)(2) may be recommended for reasons such as to offset the effects of operating conditions which differ from the dynamometer durability cycle or to increase the life of the engine beyond 1,000 hours (or the equivalent). The instructions may schedule maintenance on a calendar time basis, mileage basis, engine service time basis, or combinations of each.

§ 86.078–39 Submisison of maintenance instructions.

(a) The manufacturer shall provide to the Administrator, no later than the time of the submission required by § 86.078–23, a copy of the maintenance instructions which the manufacturer proposes to supply to the ultimate purchaser in accordance with § 86.078–38(a). The Administrator will review such instructions in determine whether they are reasonable and necessary to assure the proper functioning of the vehicle's (or engine's) emission control systems. The Administrator will notify the manufacturer of his determination whether such instructions are reasonable and necessary to assure the proper functioning of the emission control systems.

(b) Any revision to the maintenance instructions which will affect emissions shall be supplied to the Administrator at least 30 days before being supplied to the ultimate purchaser unless the Administrator consents to a lesser period of time.

§ 86.079–1 General applicability.

(a) The provisions of this subpart apply to 1979 and later model year new gasoline-fueled and Diesel light-duty vehicles, 1979 and later model year new gasoline-fueled and Diesel light-duty trucks and 1979 and later model year new gasoline-fueled and Diesel heavy-duty engines.

(b) Optional applicability. A manufacturer may request to certify any heavy-duty vehicle 10,000 pounds GVWR or less as a light-duty truck: heavy-duty vehicle provisions do not apply to such a vehicle.

§ 86.079–2 Definitions.

The following definitions apply beginning with the 1979 model year. Section 86.078–2 remains effective excepting those definitions which are hereby superseded.

"Basic vehicle frontal area" means the area enclosed by the geometric projection of the basic vehicle along the longitudinal axis, which includes tires but excludes mirrors and air deflectors, onto a plane perpendicular to the longitudinal axis of the vehicle.

"Gross vehicle weight rating" means the value specified by the manufacturer as he loaded weight of a single vehicle.

"Heavy-duty vehicle" means any motor vehicle rated at more than 8500 pounds GVWR or that has a vehicle curb weight of more than 6000 pounds or that has a basic vehicle frontal area in excess of 46 square feet.

"Incomplete truck" means any truck which does not have the primary load carrying device or container attached.

"Light-duty truck" means any motor vehicle rated at 8500 pounds GVWR or less which has a vehicle curb weight of 6000 pounds or less and which has a basic vehicle frontal area of 46 square feet or less, which is:

(1) Designed primarily for purposes of transportation of property or is a derivation of such a vehicle, or

(2) Designed primarily for transportation of persons and has a capacity of more than 12 persons, or

(3) Available with special features enabling off-street or off-highway operation and use.

"Loaded vehicle weight" means the vehicle curb weight plus 300 pounds.

"Vehicle curb weight" means the actual or the manufacturer's estimated weight of the vehicle in operational status with all standard equipment, and weight of fuel at nominal tank capacity, and the weight of optional equipment computed in accordance with § 86.078–24; incomplete light-duty trucks shall have vehicle curb weight specified by the manufacturer.

"Van" means a light-duty truck having an integral enclosure, fully enclosing the driver compartment and load carrying device, and having no body sections protruding more than 30 inches ahead of the leading edge of the windshield.

§ 86.079–9 Emission standards for 1979 and later model light-duty trucks.

(a)(1) Exhaust emissions from 1979 and later model year light-duty trucks shall not exceed:

(i) *Hydrocarbons.* 1.7 grams per vehicle mile.

(ii) *Carbon monoxide.* 18 grams per vehicle mile.

(iii) *Oxides of nitrogen.* 2.3 grams per vehicle mile.

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over a driving schedule as set forth in Subpart B and measured and calculated in accordance with those procedures.

(b) (1) Evaporative emissions from 1979 and later model year gasoline-fueled light-duty trucks shall not exceed:

(i) *Hydrocarbons.* 6.0 grams per test.

(2) The standard set forth in paragraph (b)(1) of this section refers to a composite sample of the evaporative emissions collected under the conditions set forth in Subpart B of this part and measured in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any 1979 and later model year gasoline-fueled light-duty truck.

§ 86.079–20 Incomplete vehicles, classification.

(a) An incomplete truck less than 8500 pounds gross vehicle weight rating shall be classified by the manufacturer as a light-duty truck or as a heavy-duty vehicle. Incomplete light-duty trucks shall be described in the manfuacturer's application for certification. The frontal area and curb weight used for certification purposes shall be specified on the label required in § 86.079–35(d). Incomplete heavy-duty trucks must be labeled as required in § 86.079–35(e).

§ 86.079–21 Application for certification.

(a) A separate application for a certificate of conformity shall be made for each set of standards and each class of new motor vehicles or new motor vehicle engines. Such application shall be made to the Administrator by the manufacturer and shall be updated and corrected by amendment.

(b) The application shall be in writing, signed by an authorized representative of the manufacturer, and shall include the following:

(1) Identification and description of the vehicles (or engines) covered by the application and a description of their engine (vehicles only), emission control system, and fuel system components. This shall include a detailed description of each AECD to be installed in or on any certification test vehicle (or certification test engine).

(2) Projected U.S. sales data sufficient to enable the Administrator to select a test fleet representative of the vehicles (or engines) for which certification is requested.

(3) A description of the test equipment and fuel proposed to be used.

(4) (i) A description of the proposed mileage (or service) accumulation procedures for durability testing.

(ii) A description of the test procedures to be used to establish the evaporative emission deterioration factors required to be determined and supplied in § 86.078–23(b)(2).

(5) A statement of recommended maintenance and procedures necessary to assure that the vehicles (or engines) covered by a certificate of conformity in operation conform to the regulations, and a description of the program for training of personnel for such maintenance, and the equipment required.

(6) At the option of the manufacturer, the proposed composition of the emission-data and durability-data test fleet.

(c) Complete copies of the application and of any amendments thereto, and all notifications under §§ 86.078–32, 86.078–33, and 86.078–34 shall be submitted in such multiple copies as the Administrator may require.

(d) Incomplete light-duty trucks shall have a maximum completed curb weight and maximum completed frontal area specified by the manufacturer.

§ 86.079–26 Mileage and service accumulation; emission measurements.

(a) (1) Paragraph (a) of this section applies to light-duty vehicles and light-duty trucks.

(2) The procedure for mileage accumulation will be the Durability Driving Schedule as specified in Appendix IV of this part. A modified procedure may also be used if approved in advance by the Administrator. Except with the advance approval of the Administrator, all vehicles will accumulate mileage at a measured curb weight which is within 100 pounds of the estimated curb weight. If the loaded vehicle weight is within 100 pounds of being included in the next higher inertia weight class as specified in § 86.125, the manufacturer may elect to conduct the respective emission tests at the inertia weight corresponding to the higher loaded vehicle weight. Mileage will be accumulated on four wheel drive vehicles in their normal on-highway mode of operation.

(3) *Emission-data vehicles.* Unless as otherwise provided for in § 86.078–23(a), emission-data vehicles shall be operated and tested as follows:

(i) *Gasoline-fueled.* (A) Each gasoline-fueled emission-data vehicle shall be driven 4000 miles with all emission control systems installed and operating. Complete exhaust emission tests shall be conducted at zero and 4000 miles on those vehicles selected under § 86.078–24(b)(1)(ii) through (b)(1)(v). Complete exhaust and evaporative emission tests shall be conducted at zero miles and 4000 miles on those vehicles selected under § 86.078–24(b)(1)(vii). The manufacturer may at his option test the vehicles selected under § 86.078–24(b)(1)(vii) up to three times at the 4000-mile test point as long as the ±250-mile test tolerance is adhered to. The Administrator may determine under § 86.078–24(f) that no testing is required.

(B) The emission-data vehicle(s) selected for testing under § 86.078–24(b)(1)(v) or (b)(1)(vii)(D) shall be driven 6436 kilometers (4000 miles) at any altitude. Emission tests shall be conducted at zero kilometers (zero miles) at any altitude and 6436 kilometers (4000 miles) under high-altitude conditions.

(C) The emission-data vehicle(s) selected for testing under § 86.078–24(b)(1)(v) or (b)(1)(vii)(D) and permitted to be tested for purposes of § 86.078–23(c)(1)(ii) under the provisions of § 86.078–24(b)(1)(vi) shall be driven 6436 kilometers (4000 miles) at low altitude. Emission tests shall be conducted at zero kilometers (zero miles) at low altitude and 6436 kilometers (4000 miles) under both low- and high-altitude conditions. For the purposes of this subparagraph, "low altitude" means any elevation less than 549 meters (1800 feet).

(ii) *Diesel.* (A) Each Diesel emission-data vehicle shall be driven 6436 kilometers (4000 miles) with all emission control systems installed and operating. Emission tests shall be conducted at zero kilometers (zero miles) and 6436 kilometers (4000 miles).

(B) The emission-data vehicle(s) selected for testing under § 86.078–24(b)(1)(v) shall be driven 6436 kilometers (4000 miles) at any altitude. Emission tests shall be conducted at zero kilometers (zero miles) at any altitude and 6436 kilometers (4000 miles) under high-altitude conditions.

(C) The emission-data vehicle(s) selected for testing under § 86.078–24(b)(1)(v) and permitted to be tested for purposes of § 86.078–23(c)(1)(ii) under the provisions of § 86.078–24(b)(1)(vi) shall be driven 6436 kilometers (4000 miles) at low altitude. Emission tests shall be conducted at zero kilometers (zero miles) at low altitude and 6436 kilometers (4000 miles) under both low- and high-altitude conditions. For the purpose of this subparagraph "low altitude" means any elevation less than 549 meters (1800 feet).

(4) *Durability-data vehicles.* Unless as otherwise provided for in § 86.078–23(a), durability-data vehicles shall be operated and tested as follows:

(i) *Gasoline-fueled.* Each gasoline-fueled durability-data vehicle selected by the Administrator or elected by the manufacturer under § 86.078–24(c)(1) shall be driven, with all emission control systems installed and operating, for 50,000 miles or such lesser distance as the Administrator may agree to as meeting the objective of this procedure. Complete exhaust emission tests shall be made on all durability-data vehicles selected by the Administrator or elected by the manufacturer under § 86.078–24(c) at the following mileage points: 0; 5,000; 10,000; 15,000; 20,000; 25,000; 30,000; 35,000; 40,000; 45,000; 50,000. The Administrator may determine under § 86.078–24(f) that no testing is required.

(ii) *Diesel.* Each Diesel durability-data vehicle shall be driven, with all emission control systems installed and operating, for 50,000 miles or such lesser distance as the Administrator may agree to as meeting the objectives of the procedure. Complete emission tests (see §§ 86.106 through 86.145) shall be made at the following mileage points: 0; 5,000; 10,000; 15,000; 20,000; 25,000; 30,000; 35,000; 40,000; 45,000; 50,000.

(5) All tests required by this subpart to be conducted after every 5,000 miles of driving for durability-data vehicles and 4,000 miles for emission-data vehicles must be conducted at any accumulated mileage within 250 miles of each of those test points.

(6) (i) The results of each emission test shall be supplied to the Administrator immediately after the test. The

manufacturer shall furnish to the Administrator explanation for voiding any test. The Administrator will determine if voiding the test was appropriate based upon the explanation given by the manufacturer for the voided test. If a manufacturer conducts multiple tests at any test point at which the data are intended to be used in the calculation of the deterioration factor, the number of tests must be the same at each point and may not exceed three valid tests. Tests between test points may be conducted as required by the Administrator. Data from all tests (including voided tests) shall be air posted to the Administrator within 24 hours (or delivered within 3 working days). In addition, all test data shall be compiled and provided to the Administrator in accordance with § 86.078–23. Where the Administrator conducts a test on a durability-data vehicle at a prescribed test point, the results of that test will be used in the calculation of the deterioration factor.

(ii) The results of all emission tests shall be rounded, using the "Rounding Off Method" specified in ASTM E29–67, to the number of places to the right of the decimal point indicated by expressing the applicable emission standards of this subpart to three significant figures.

(7) Whenever the manufacturer proposes to operate and test a vehicle which may be used for emission or durability data, he shall provide the zero-mile test data to the Administrator (except for those vehicles for which the zero-mile test requirement has been waived under § 86.078–23(a)(2)) and make the vehicle available for such testing under § 86.078–29 as the Administrator may require before beginning to accumulate mileage on the vehicle. Failure to comply with this requirement will invalidate all test data submitted for this vehicle.

(8) Once a manufacturer begins to operate an emission-data or durability-data vehicle, as indicated by compliance with paragraph (a)(7) of this section, he shall continue to run the vehicle to 4,000 miles or 50,000 miles, respectively, and the data from the vehicle will be used in the calculations under § 86.078–28. Discontinuation of a vehicle shall be allowed only with the written consent of the Administrator.

(9) (i) The Administrator may elect to operate and test any test vehicle during all or any part of the mileage accumulation and testing procedure. In such cases, the manufacturer shall provide the vehicle(s) to the Administrator with all information necessary to conduct this testing.

(ii) The test procedures in §§ 86.106 through 86.145 will be followed by the Administrator. The Administrator will test the vehicles at each test point. Maintenance may be performed by the manufacturer under such conditions as the Administrator may prescribe.

(iii) The data developed by the Administrator for the engine-system combination shall be combined with any applicable data supplied by the manufacturer on other vehicles of that combination to determine the applicable deterioration factors for the combination. In the case of a significant discrepancy between data developed by the Administrator and that submitted by the manufacturer, the Administrator's data shall be used in the determination of deterioration factors.

(10) Emission testing of any type with respect to any certification vehicle other than that specified in this part is not allowed except as such testing may be specifically authorized by the Administrator.

(11) This section does not apply to testing conducted to meet the requirements of § 86.078–23(b)(2).

(b) (1) Paragraph (b) of this section applies to gasoline-fueled heavy-duty engines.

(2) The engine dynamometer service accumulation schedule will consist of several operating conditions which give the same percentage of time at various manifold vacuums and modes as specified in the emission test cycle. The average speed shall be between 1,650 and 1,700 r.p.m. Subject to the requirements as to average speed, there must be operation at speeds in excess of 3,200 r.p.m. (but not in excess of governed speed for governed engines or rated speed for nongoverned engines) for a cumulative maximum of 0.5 percent of the actual cycle time, excluding time in transient conditions. Maximum cycle time shall be 15 minutes. A cycle approved in advance by the Administrator shall be used.

(3) *Emission-data engines.* Unless as otherwise provided for in § 86.078–23(a), emission-data engines shall be operated and tested as follows: Each emission-data engine shall be operated for 125 hours with all emission control systems installed and operating. Emission tests shall be conducted at zero and 125 hours. Evaporative emission controls need not be connected provided normal operating conditions are maintained in the engine induction system.

(4) *Durability-data engines.* Unless as otherwise provided for in § 86.078–23(a), durability-data engines shall be operated and tested as follows: Each durability-data engine shall be operated with all emission control systems installed and operating, for 1,500 hours. Emission tests shall be conducted at zero hours and at each 125-hour interval. Evaporative emission controls need not be connected provided normal operating conditions are maintained in the engine induction system.

(5) All tests required by this subpart to be conducted after 125 hours of operation or at any multiple of 125 hours may be conducted at any accumulated number of hours within 6 hours of 125 hours or the appropriate multiple of 125 hours, respectively.

(6) (i) The results of each emission test shall be supplied to the Administrator within 72 hours (or delivered within 5 working days). The manufacturer shall furnish to the Administrator an explanation for voiding any test. The Administrator will determine if voiding the test was appropriate based upon the explanation given by the manufacturer for the voided test. If a manufacturer conducts multiple tests at any test point at which the data are intended to be used in the calculation of the deterioration factor, the number of tests must be the same at each point and may not exceed three valid tests. Tests between test points may be conducted as required by the Administrator. Data from all tests (including voided tests) shall be air posted to the Administrator within 72 hours (or delivered within 5 working days). In addition, all test data shall be compiled and provided to the Administrator in accordance with § 86.078–23. Where the Administrator conducts a test on a durability-data engine at a prescribed test point, the results of that test will be used in the calculation of the deterioration factor.

(ii) The results of all emission tests shall be recorded and reported to the Administrator using two places to the right of the decimal point. These numbers shall be rounded in accordance with the "Rounding Off Method" specified in ASTM E29–67.

(7) Whenever the manufacturer proposes to operate and test an engine which may be used for emission or durability data, he shall provide the zero-hour test data to the Administrator (except for those engines for which the zero-hour test requirement has been waived under § 86.078–23(a)(2)) and make the engine available for such testing under § 86.078–29 as the Administrator may require, before beginning to accumulate hours on the engine. Failure to comply with this requirement will invalidate all test data later submitted for this engine.

(8) Once a manufacturer begins to operate an emission-data or durability-data engine, as indicated by compliance with paragraph (b)(7) of this section, he shall continue to run the engine to 125 hours or 1,500 hours, respectively, and the data from the engine will be used in the calculations under § 86.078–28. Discontinuation of an engine shall be allowed only with the prior written consent of the Administrator.

(9) (i) The Administrator may elect to operate and test any test engine during all or any part of the service accumulation and testing procedure. In such cases the manufacturer shall provide the engine(s) to the Administrator with all information necessary to conduct the testing.

(ii) The test procedures (§§ 86.777–5 through 86.777–15) will be followed by the Administrator. The Administrator will test the engines at each test point. Maintenance may be performed by the manufacturer under such conditions as the Administrator may prescribe.

(iii) The data developed by the Administrator for the engine-system combination shall be combined with any applicable data supplied by the manufacturer on other engines of that combination to determine the applicable deterioration factors for the combination. In the case of a significant discrepancy between data developed by the Administrator and that submitted by the manufacturer, the Administrator's data shall

be used in the determination of deterioration factors.

(10) Emission testing of any type with respect to any certification engine other than that specified in this subpart is not allowed except as such testing may be specifically authorized by the Administrator.

(c)(1) Paragraph (c) of this section applies to Diesel heavy-duty engines.

(2) The procedures set forth in this section describe the service accumulation that shall be accomplished on each test engine and when tests are to be conducted.

(3)(i) *Emission-data engines.* Unless as otherwise provided for in § 86.078–23(a), emission-data engines shall be operated and tested as follows: Each emission-data engine shall be operated for 125 hours with all emission control systems installed and operating. Emission tests shall be conducted at zero and 125 hours.

(ii) *Durability-data engines.* Unless as otherwise provided for in § 86.078–23(a), durability-data engines shall be operated and tested as follows: Each durability-data engine shall be operated, with all emission control systems installed and operating, for 1,000 hours. Emission tests shall be conducted at zero hours and at each 125-hour interval.

(4) A break-in procedure, not to exceed 20 hours, may be run if approved in writing in advance by the Administrator. This procedure would be run after the zero-hour test, and the hours accumulated would not be counted as part of the service accumulation.

(5) Before service accumulation can begin, the following criteria must be met. Failure to comply with these requirements shall invalidate all test data submitted for an engine.

(i) Each engine shall produce at least 95 percent of the maximum horsepower, corrected to rating conditions, at 95 to 100 percent of the rated speed.

(ii) The fuel rate at maximum horsepower shall be within manufacturer's specifications.

(iii) The zero-hour test data shall be provided to the Administrator (except for those engines for which the zero-hour test requirement has been waived under § 86.078–23(a)(2)) and the engine shall be made available for such testing under § 86.078–29 as the Administrator may require.

(6) During service accumulation, hours can be credited toward the required service accumulation hours when the following criteria are met. If these criteria cannot be met, engine operation shall be discontinued and the Administrator shall be notified immediately. (Adjustments to the fuel rate can be approved under the provisions of § 86.078–25).

(i) Each engine shall produce at least 95 percent of the maximum horsepower, at 95 to 100 percent of the rated speed, observed during zero-hour testing. Horsepower values shall be corrected to the rating conditions.

(ii) The engine shall be operated at 75 percent of the inlet and exhaust restrictions specified in § 86.877–8 except that the tolerance will be ±3 inches of water and ±0.5 inches of Hg, respectively.

(7) During each emission test the inlet and exhaust restrictions shall be as specified in § 86.877–8.

(8) Tests, other than zero-hour tests, may be conducted within 8 hours of the nominal test point.

(9)(i) The results of each emission test shall be air posted to the Administrator within 72 hours of test completion (or delivered within 5 working days). The manufacturer shall furnish to the Administrator an explanation for voiding any test. The Administrator will determine if voiding the test was appropriate based upon the explanation given by the manufacturer for the voided tests. If a manufacturer conducts multiple tests (not to exceed three valid tests) at any test point, the number of tests must be the same at each point. The data obtained from all valid tests shall be used in the calculation of the deterioration factor. Tests between test points may be conducted as required by the Administrator. Data from all tests (including voided tests) shall be air posted to the Administrator within 72 hours (or delivered within 5 working days). In addition, all test data shall be compiled and provided to the Administrator in accordance with § 86.078–23. Where the Administrator conducts a test on a durability-data engine at a prescribed test point, the results of that test will be used in the calculation of the deterioration factor.

(ii) The results of all emission tests shall be recorded and reported to the Administrator using two places to the right of the decimal point. These numbers shall be rounded in accordance with the "Rounding Off Method" specified in ASTM E29–67.

(10) Once a manufacturer begins to operate an emission-data or durability-data engine, as indicated by compliance with paragraph (c) of this section, he shall continue to run the engine to 125 hours or 1,000 hours respectively, and the data from the engine shall be used in the calculations under § 86.078–28. Discontinuation of an engine shall be allowed only with the prior written consent of the Administrator.

(11)(i) The Administrator may elect to operate and test any test engine during all or any part of the service accumulation and testing procedure. In such cases, the manufacturer shall provide the engine(s) to the Administrator with all information necessary to conduct the testing.

(ii) The test procedures (§§ 86.877–5 through 86.877–14 and §§ 86.977–5 through 86.977–15) will be followed by the Administrator. The Administrator will test the engines at each test point. Maintenance may be performed by the manufacturer under such conditions as the Administrator may prescribe.

(iii) The data developed by the Administrator for the engine-system combination shall be combined with any applicable data supplied by the manufacturer on other engines of that combination to determine the applicable deterioration factors for the combination. In the case of a significant discrepancy between data developed by the Administrator and that submitted by the manufacturer, the Administrator's data shall be used in the determination of deterioration factors.

(12) Emission testing of any type with respect to any certification engine other than that specified in this part is not allowed except as such testing may be specifically authorized by the Administrator.

(a)(1) If, after a review of the test reports and data submitted by the manufacturer, data derived from any inspection carried out under § 86.078–7(c) and any other pertinent data or information, the Administrator determines that a test vehicle(s) (or test engine(s)) meets the requirements of the Act and of this subpart, he will issue a certificate of conformity with respect to such vehicle(s) (or engine(s)) except in cases covered by paragraph (c) of this section. If applicable, the certificate will state which vehicles are certified for sale at high altitude.

(2) Such certificate will be issued for such period not to exceed one model year as the Administrator may determine and upon such terms as he may deem necessary to assure that any new motor vehicle (or new motor vehicle engine) covered by the certificate will meet the requirements of the Act and of this part. Each such certificate shall contain the following language:

This certificate covers only those new motor vehicles (or new motor vehicle engines) which conform, in all material respects, to the design specifications that applied to those vehicles (or engines) described in the application for certification and which are produced during the ____ model year production period of the said manufacturer, as defined in 40 CFR § 86.079–2.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR § 86.078–7(c) which concern either the vehicle (or engine) certified, or any production vehicle (or production engine) covered by this certificate, or any production vehicle (or production engine) which when completed will be claimed to be covered by this certificate. Failure to comply with all the requirements of § 86.078–7(c) with respect to any such vehicle (or engine) may lead to revocation or suspension of this certificate as specified in 40 CFR § 86.079–30(c). It is also a term of this certificate that this certificate may be revoked or suspended for the other reasons stated in § 86.079–30 (c) or (d).

(3) One such certificate will be issued for each engine family and will certify compliance with no more than one set of applicable standards except that for gasoline-fueled light-duty vehicles and light-duty trucks, one such certificate will be issued for each engine family-evaporative emission family combination and will certify compliance with no more than one set of applicable standards.

(4) A violation of section 203(a)(1) of the Clean Air Act occurs when any manufacturer sells, offers for sale, introduces or delivers for introduction into commerce, any light-duty vehicle or

light-duty truck, subject to the regulations under the Act, which is not covered by a certificate of conformity at high altitude issued under this part:

(i) At a designated high-altitude location, unless such manufacturer has substantial reason to believe that such motor vehicle will not be sold to an ultimate purchaser for principal use at a designated high-altitude location; or,

(ii) At an other than a designated high-altitude location, when such manufacturer has reason to believe that such motor vehicle is intended by the ultimate purchaser to be used principally at a designated high-altitude location.

(5) For the purpose of paragraph (a) of this section, "designated high-altitude location" is any county which has substantially all of its area located above 1219 meters (4,000 feet) and which is identified below.

COUNTIES LOCATED SUBSTANTIALLY ABOVE 1,219 METERS (4,000 FEET) IN ELEVATION

STATE OF ARIZONA

Apache	Navajo

STATE OF COLORADO

Adams	Jefferson
Alamosa	Lake
Arapahoe	La Plata
Archuleta	Larimer
Boulder	Las Animas
Chaffee	Lincoln
Clear Creek	Mesa
Conejos	Mineral
Costilla	Moffat
Crowley	Montezuma
Custer	Montrose
Dolores	Morgan
Delta	Ouray
Denver	Park
Douglas	Pitkin
Eagle	Pueblo
Elbert	Rio Blanco
El Paso	Rio Grande
Fremont	Routt
Garfield	Saguache
Gilpin	San Juan
Grand	San Miguel
Gunnison	Summit
Hinsdale	Teller
Huerfano	Washington
Jackson	Weld

STATE OF IDAHO

Bannock	Custer
Bear Lake	Franklin
Bingham	Fremont
Blaine	Jefferson
Bonneville	Madison
Butte	Minidoka
Camas	Oneida
Caribou	Power
Cassia	Teton
Clark	Valley

STATE OF MONTANA

Beverhead	Madison
Deer Lodge	Meagher
Gallatin	Park
Jefferson	Silver Bow

STATE OF NEBRASKA

Banner	Sioux
Kimball	

STATE OF NEVADA

Carson City	Lander
Douglas	Lyon
Elko	Mineral
Esmeralda	Storey
Eureka	White Pine
Humboldt	

STATE OF NEW MEXICO

Bernalillo	Mora
Catron	Rio Arriba
Colfax	Sandoval
Curry	San Juan
De Baca	San Miguel
Grant	Santa Fe
Guadalupe	Sierra
Harding	Socorro
Lincoln	Taos
Los Alamos	Torrance
Luna	Union
McKinley	Valencia

STATE OF OREGON

Lake	

STATE OF UTAH

Beaver	Piute
Box Elder	Rich
Cache	Salt Lake
Carbon	San Juan
Daggett	Sanpete
Davis	Sevier
Duchesne	Summit
Emery	Tooele
Grand	Uintah
Iron	Utah
Juab	Wasatch
Kane	Wayne
Millard	Weber
Morgan	

STATE OF WYOMING

Albany	Natrona
Carbon	Niobrara
Converse	Park
Fremont	Platte
Goshen	Sublette
Hot Springs	Sweetwater
Johnson	Teton
Laramie	Uinta
Lincoln	Weston

(6) The provisions of paragraph (a)(4) of this section shall not apply to any light-duty vehicle or light-duty truck, sold, offered for sale, introduced, or delivered for introduction into commerce in California, provided that the vehicle is covered by a certificate of conformity with emission standards in effect in California.

(7) Certificates issued for light-duty vehicles or light-duty trucks certified with catalytic converters shall be subject to the following term in addition to the term in paragraph (a)(2) of this section: "Catalyst-equipped vehicles, otherwise covered by this certificate, which are driven outside the United States, Canada, and Mexico will be presumed to have been operated on leaded gasoline resulting in deactivation of the catalysts. If these vehicles are imported or offered for importation without retrofit of the catalyst, they will be considered not to be within the coverage of this certificate unless included in a catalyst control program operated by a manufacturer or a United States Government Agency and approved by the Administrator."

(8) Certificates issued for incomplete light-duty trucks shall be subject to the following term in addition to the term in paragraph (a)(2) of this section: "For incomplete light-duty trucks, this certificate covers only those new motor vehicles which when completed by having the primary load carry device or container attached, conform to the maximum curb weight and frontal area limitations described in the application for certification as required in 40 CFR 86.079-21(d)."

(9) Certificates issued for heavy-duty engines shall be subject to the following term in addition to the term in paragraph (a)(2) of this section: "For heavy-duty engines, this certificate covers only those new motor vehicle engines installed in heavy-duty vehicles which conform to the minimum gross vehicle weight rating, curb weight, or frontal area limitations for heavy-duty vehicles described in 40 CFR 86.079-2."

(b)(1) The Administrator will determine whether a vehicle (or engine) covered by the application complies with applicable standards by observing the following relationships:

(i) *Light-duty vehicles and light-duty trucks.*

(A) The durability-data vehicle(s) selected under § 86.078-24(c)(1)(i) shall represent all vehicles of the same engine-system combination.

(B) The emission-data vehicle(s) selected under § 86.078-24 (b)(1)(ii), (b)(1)(iii), and (b)(1)(iv) shall represent all vehicles of the same engine-system combination as applicable to be sold below 4000 ft.

(C) The emission-data vehicle(s) selected under § 86.078-24 (b)(1)(vii)(A) and (b)(1)(vii) (B) shall represent all vehicles of the same evaporative control system within the evaporative family, as applicable, to be sold below 4000 ft.

(D) The emission-data vehicle(s) selected under § 86.078-24(b)(1)(v) shall represent all vehicles of the same engine-system combination to be sold at high altitude.

(E) The emission-data vehicle(s) selected under § 86.078-24(b)(1)(vii)(D) shall represent all vehicles of the same evaporative control system within the evaporative family sold at high altitude.

(ii) *Gasoline-fueled heavy-duty engines.*

(A) A test engine selected under § 86.078-24(b)(2)(ii) and (iv) shall represent all engines in the same engine family of the same engine displacement-exhaust emission control system combination.

(B) A test engine selected under § 86.078-24(b)(2)(iii) shall represent all engines in the same engine family of the same engine displacement-exhaust emission control system combination.

(C) A test engine selected under § 86.078-24(c)(2)(i) shall represent all engines of the same engine-system combination.

(iii) *Diesel heavy-duty engines.*

(A) A test engine selected under § 86.078-24(b)(3)(ii) shall represent all engines in the same engine-system combination.

(B) A test engine selected under § 86.078-24(b)(3)(iii) shall represent all engines of that emission control system at the rated fuel delivery of the test engine.

(C) A test engine selected under § 86.078-24(c)(3)(i) shall represent all engines of the same engine-system combination.

(2) The Administrator will proceed as in paragraph (a) of this section with respect to the vehicles (or engines) be-

longing to an engine family or engine family-evaporative emission family combination (as applicable), all of which comply with all applicable standards.

(3) If, after a review of the test reports and data submitted by the manufacturer, data derived from any additional testing conducted pursuant to § 86.078–29, data or information derived from any inspection carried out under § 86.078–7(c) or any other pertinent data or information, the Administrator determines that one or more test vehicles (or test engines) of the certification test fleet do not meet applicable standards, he will notify the manufacturer in writing, setting forth the basis for his determination. Within 30 days following receipt of the notification, the manufacturer may request a hearing on the Administrator's determination. The request shall be in writing, signed by an authorized representative of the manufacturer and shall include a statement specifying the manufacturer's objections to the Administrator's determination and data in support of such objections. If, after a review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 86.078–6 with respect to such issue.

(4) For light-duty vehicles and light-duty trucks the manufacturer may, at his option, proceed with any of the following alternatives with respect to an emission-data vehicle determined not in compliance with all applicable standards for which it was tested:

(i) Request a hearing under § 86.078–6; or

(ii) Remove the vehicle configuration (or evaporative vehicle configuration, as applicable) which failed, from his application:

(A) If the failed vehicle was tested for compliance with exhaust emission standards only: The Administrator may select, in place of the failed vehicle, in accordance with the selection criteria employed in selecting the failed vehicle, a new emission-data vehicle to be tested for exhaust emission compliance only.

(B) If the failed vehicle was tested for compliance with both exhaust and evaporative emission standards: The Administrator may select, in place of the failed vehicle, in accordance with the selection criteria employed in selecting the failed vehicle, a new emission-data vehicle which will be tested for compliance with both exhaust and evaporative emission standards. If one vehicle cannot be selected in accordance with the selection criteria employed in selecting the failed vehicle, then two vehicles may be selected (i.e., one vehicle to satisfy the exhaust emission vehicle selection criteria and one vehicle to satisfy the evaporative emission vehicle selection criteria). The vehicle selected to satisfy the exhaust emission vehicle selection criteria will be tested for compliance with exhaust emission standards only. The vehicle selected to satisfy the evaporative emission vehicle selection criteria will be tested for compliance with both exhaust and evaporative emission standards; or

(iii) Remove the vehicle configuration (or evaporative vehicle configuration, as applicable) which failed from his application and add a vehicle configuration(s) (or evaporative vehicle configuration(s), as applicable) not previously listed. The Administrator may require, if applicable, that the failed vehicle be modified to the new engine code (or evaporative emission code, as applicable) and demonstrate by testing that it meets applicable standards for which it was originally tested. In addition, the Administrator may select, in accordance with the vehicle selection criteria given in § 86.078–24(b), a new emission-data vehicle or vehicles. The vehicles selected to satisfy the exhaust emission vehicle selection criteria will be tested for compliance with exhaust emission standards only. The vehicles selected to satisfy the evaporative emission vehicle selection criteria will be tested for compliance with both exhaust and evaporative emission standards; or

(iv) Correct a component or system malfunction and show that with a correctly functioning system or component the failed vehicle meets applicable standards for which it was originally tested. The Administrator may require a new emission-data vehicle, of identical vehicle configuration (or evaporative vehicle configuration as applicable) to the failed vehicle, to be operated and tested for compliance with the applicable standards for which the failed vehicle was originally tested.

(5) For heavy-duty engines the manufacturer may, at his option, proceed with any of the following alternatives with respect to any engine family represented by a test engine(s) determined not in compliance with applicable standards:

(i) Request a hearing under § 86.078–6; or

(ii) Delete from the application for certification the engines represented by the failing test engine. (Engines so deleted may be included in a later request for certification under § 86.078–32.) The Administrator will then select in place of each failing engine an alternate engine chosen in accordance with selection criteria employed in selecting the engine that failed; or

(iii) Modify the test engine and demonstrate by testing that it meets applicable standards. Another engine which is in all material respects the same as the first engine, as modified, shall then be operated and tested in accordance with applicable test procedures.

(6) If the manufacturer does not request a hearing or present the required data under paragraphs (b)(4) or (b)(5) (as applicable) of this section, the Administrator will deny certification.

(c)(1) Notwithstanding the fact that any certification vehicle(s) (or certification engine(s)) may comply with other provisions of this subpart, the Administrator may withhold or deny the issuance of a certificate of conformity (or suspend or revoke any such certificate which has been issued) with respect to any such vehicle(s) (or engine(s)) if:

(i) The manufacturer submits false or incomplete information in his application for certification thereof;

(ii) The manufacturer renders inaccurate any test data which he submits pertaining thereto.

(iii) Any EPA Enforcement Officer is denied access on the terms specified in § 86.078–7(c) to any facility or portion thereof which contains any of the following:

(A) The vehicle (or engine);

(B) Any components used or considered for use in its modification or build up into a certification vehicle (or certification engine);

(C) Any production vehicle (or production engine), which is or will be claimed by the manufacturer to be covered by the certificate;

(D) Any step in the construction of a vehicle (or engine) described in (C) of this subdivision;

(E) Any records, documents, reports, or histories required by this part to be kept concerning any of the above.

(iv) Any EPA Enforcement Officer is denied "reasonable assistance" (as defined in § 86.078–7(c)) in examining any of the items listed in paragraph (c)(1)(iii) of this section.

(2) The sanctions of withholding, denying, revoking, or suspending of a certificate may be imposed for the reasons in paragraphs (c)(1)(i), (ii), (iii), or (iv) of this section only when the infraction is substantial.

(3) In any case in which a manufacturer knowingly submits false or inaccurate information or knowingly renders inaccurate or invalid any test data or commits any other fraudulent acts and such acts contribute substantially to the Administrator's decision to issue a certificate of conformity, the Administrator may deem such certificate void ab initio.

(4) In any case in which certification of a vehicle (or engine) is proposed to be withheld, denied, revoked, or suspended under paragraph (c)(1)(iii), or (c)(1)(iv) of this section, and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.078–7(c) in fact occurred, the manufacturer, if he wishes to contend that, even though the violation occurred, the vehicle (or engine) in question was not involved in the violation to a degree that would warrant withholding denial, revocation, or suspension of certification under either paragraph (c)(1)(iii) or (c)(1)(iv) of this section, shall have the burden of establishing that contention to the satisfaction of the Administrator.

(5) Any revocation or suspension of certification under paragraph (c)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.078–6 hereof.

(ii) Extend no further than to forbid the introduction into commerce of vehicles (or engines) previously covered by certification which are still in the hands of the manufacturer, except in cases of

such fraud or other misconduct as makes certification invalid ab initio.

(6) The manufacturer may request in the form and manner specified in paragraph (b)(3) of this section that any determination made by the Administrator under paragraph (c)(1) of this section to withhold or deny certification be reviewed in a hearing conducted in accordance with § 86.078–6. If the Administrator finds, after a review of the request and supporting data, that the request raises a substantial factual issue he will grant the request with respect to such issue.

(d)(1) *For light-duty vehicles and light-duty trucks,* notwithstanding the fact that any vehicle configuration or engine family may be covered by a valid outstanding certificate of conformity, the Administrator may suspend such outstanding certificate of conformity in whole or in part with respect to such vehicle configuration or engine family if:

(i) The manufacturer refuses to comply with the provisions of a test order issued by the Administrator pursuant to § 86.603; or

(ii) The manufacturer refuses to comply with any of the requirements of § 86.603; or

(iii) The manufacturer submits false or incomplete information in any report or information provided pursuant to the requirements of § 86.609; or

(iv) The manufacturer renders inaccurate any test data which he submits pursuant to § 86.609; or

(v) Any EPA Enforcement Officer is denied access to a facility on the terms specified in § 86.606.

(vi) Any EPA Enforcement Officer is denied the opportunity on the terms specified in § 86.606 to

(A) Monitor vehicle selection pursuant to § 86.607,

(B) Select vehicles for testing pursuant to § 86.607, or

(C) Monitor vehicle testing performed to satisfy any of the requirements of this part; or

(vii) Any EPA Enforcement Officer is denied "reasonable assistance" as defined in § 86.606 in examining any of the items listed in that section; or

(viii) The manufacturer refuses to comply with the requirements of §§ 86.-604(a), 86.605, 86.607, 86.608, 86.610, or 86.611.

(2) The sanction of suspending a certificate may not be imposed for the reasons in paragraphs (d)(1)(i), (ii) or (viii) of this section where such refusal is caused by conditions and circumstances outside the control of the manufacturer which renders it impossible to comply with those requirements. Such conditions and circumstances shall include, but are not limited to, any uncontrollable factors which result in the temporary unavailability of equipment and personnel needed to conduct the required tests, such as equipment breakdown or failure or illness of personnel, but shall not include failure of the manufacturer to adequately plan for and provide the equipment and personnel needed to conduct the tests. The manufacturer will bear the burden of establishing the presence of the conditions and circumstances required by this paragraph.

(3) The sanctions of suspending a certificate may be imposed for the reasons in paragraphs (d)(1), (iii), (iv), (v), (vi), (vii) of this section only when the infraction is substantial.

(4) In any case in which a manufacturer knowingly submitted false or inaccurate information or knowingly rendered inaccurate any test data or committed any other fraudulent acts, and such acts contributed substantially to the Administrator's original decision not to suspend or revoke a certificate of conformity in whole or in part, the Administrator may deem such certificate void from the date of such fraudulent act.

(5) In any case in which certification of a vehicle is proposed to be suspended under paragraph (d)(1)(v), (d)(1)(vi), or (d)(1)(vii) of this section, and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.606 in fact occurred, the manufacturer, if he wishes to contend that, even though the violation occurred, the vehicle configuration or engine family in question was not involved in the violation to a degree that would warrant suspension of certification under either paragraph (d)(1)(v), (d)(1)(vi), or (d)(1)(vii) of this section, shall have the burden of establishing that contention to the satisfaction of the Administrator.

(6) Any suspension of certification under paragraph (d)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.613 hereof and

(ii) Not apply to vehicles no longer in the hands of the manufacturer.

§ 86.079–35 Labeling.

(a) The manufacturer of any motor vehicle (or motor vehicle engine) subject to the applicable emission standards of this subpart, shall at the time of manufacture, affix a permanent legible label, of the type and in the manner described below, containing the information hereinafter provided, to all production models of such vehicles (or engines) available for sale to the public and covered by a certificate of conformity under § 86.078–30(a).

(1) *Light-duty vehicles and light-duty trucks.* (i) A permanent legible label shall be affixed in a readily visible position in the engine compartment.

(ii) The label shall be affixed by the vehicle manufacturer who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label. The label shall not be affixed to any equipment which is easily detached from such vehicle.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals, which shall be of a color that contrasts with the background of the label:

(A) The label heading: Vehicle Emission Control Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine displacement (in cubic inches), engine family identification and evaporative family identification.

(D) Engine tuneup specifications and adjustments, as recommended by the manufacturer in accordance with the altitude at which the vehicle is to be sold to the ultimate purchaser, including but not limited to idle speed(s), ignition timing, the idle air-fuel mixture setting procedure and value (e.g., idle CO, idle air-fuel ratio, idle speed drop), high idle speed, initial injection timing, and valve lash (as applicable) as well as other parameters deemed necessary by the manufacturer. These specifications should indicate the proper transmission position during tuneup and what accessories (e.g., air conditioner), if any, should be in operation;

(E) An unconditional statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations which apply to light-duty vehicles or light-duty trucks.

(F) The altitude at which the vehicle is intended for sale to the public as specified by a certificate of conformity under § 86.078–30.

(2) *Gasoline-fueled heavy-duty engines.* (i) A permanent legible label shall be affixed to the engine in a position in which it will be readily visible after installation in the vehicle.

(ii) The label shall be attached to an engine part necessary for normal engine operation and not normally requiring replacement during engine life.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals which shall be of a color that contrasts with the background of the label:

(A) The label heading: Engine Exhaust Emission Control Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine displacement (in cubic inches) and engine family identification;

(D) Date of engine manufacture (month and year);

(E) Engine tuneup specifications and adjustments as recommended by the manufacturer, including idle speed, ignition timing, and the idle air-fuel mixture setting procedure and value (e.g., idle CO, idle air-fuel ratio, idle speed drop), and valve lash. These specifications should indicate the proper transmission position during tuneup and what accessories (e.g., air conditioner), if any, should be in operation;

(F) An unconditional statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations applicable to gasoline-fueled heavy-duty engines.

(iv) The label may be made up of one or more pieces provided that all pieces are permanently attached to the same engine part.

(3) *Diesel heavy-duty engines.* (i) A permanent legible label shall be affixed to the engine in a position in which it will be readily visible after installation in the vehicle.

(ii) The label shall be attached to an engine part necessary for normal engine operation and not normally requiring replacement during engine life.

(iii) The label shall contain the following information lettered in the English language in block letters and numerals which shall be of a color that contrasts with the background of the label:

(A) The label heading: Engine Exhaust Emission Control Information;

(B) Full corporate name and trademark of manufacturer;

(C) Engine family identification and model;

(D) Date of engine manufacture (month and year);

(E) Engine specification:

Advertised hp. ____ at ____ r.p.m.
Fuel rate at advertised hp. ____ mm³/stroke.
Valve lash ____ (inches).
Initial injection timing (if adjustable) ____.
(The information applicable to each engine is to be inserted on the appropriate line.)

(F) An unconditional statement of compliance with the appropriate model year U.S. Environmental Protection Agency regulations applicable to Diesel heavy-duty engines.

(iv) The label may be made up of one or more pieces provided that all pieces are permanently attached to the same engine or vehicle part as applicable.

(b) The provisions of this section shall not prevent a manufacturer from also reciting on the label that such vehicle (or engine) conforms to any applicable state emission standards for new motor vehicles (or new motor vehicle engines) or any other information that such manufacturer deems necessary for, or useful to, the proper operation and satisfactory maintenance of the vehicle (or engine).

(c) (1) The manufacturer of any light-duty vehicle or light-duty truck subject to the emission standards of this subpart shall, in addition and subsequent to setting forth those statements on the label required by the Department of Transportation (DOT) pursuant to 49 CFR 567.4 set forth on the DOT label or on an additional label located in proximity to the DOT label and affixed as described in 49 CFR 567.4(b), the following information in the English language, lettered in block letters and numerals not less than three thirty-seconds of an inch high, of a color that contrasts with the background of the label:

(i) The Heading: "Vehicle Emission Control Information"

(ii) The Statement: "This Vehicle Conforms to U.S. EPA Regulations Applicable to 1978 Model Year New Motor Vehicles"

(iii) One of the following statements, as applicable, in letters and numerals not less than six thirty-seconds of an inch high and of a color that contrasts with the background of the label:

(A) For all vehicles certified as non-catalyst-equipped: "NON-CATLYST"

(B) For all vehicles certified as catalyst-equipped which are included in a manufacturer's catalyst control program for which approval has been given by the Administrator: "CATALYST—APPROVED FOR IMPORT"

(C) For all vehicles certified as catalyst-equipped which are not included in a manufacturer's catalyst control program for which prior approval has been given by the Administrator: "CATALYST"

(2) In lieu of selecting either of the labeling options of paragraph (c)(1) of this section, the manuafacturer may add the information required by paragraph (c)(1)(iii) of this section to the label required by paragraph (a) of this section. The required information will be set forth in the manner prescribed by paragraph (c)(1)(iii).

(d) Incomplete light-duty trucks and incomplete heavy-duty vehicles optionally certified as light duty trucks shall have the following statement printed on the label required in paragraph (a)(1) of this section in lieu of the statement required by (a)(1)(iii)(E) of this section: "This vehicle conforms to U.S. EPA regulations applicable to 19__ Model Year New Motor Vehicles when completed at a maximum curb weight of ____ pounds and a maximum frontal area of ____ square feet."

(e) Incomplete heavy-duty vehicles having an 8500 pound gross vehicle weight rating or less shall have the following statement printed on the label required in paragraph (a)(2) or (a)(3) of this section in lieu of the statement required by paragraph (a)(2)(iii)F or (a)(3)(iii)F of this section: "This engine conforms to U.S. EPA regulations applicable to 19__ Model Year New Heavy Duty Engines when installed in a vehicle completed at a curb weight of more than 6000 pounds or with a frontal area greater than 46 square feet."

(f) The manufacturer of any incomplete vehicle shall notify the purchaser of such vehicle of any curb weight, frontal area or gross vehicle weight rating limitations affecting the emissions certificate applicable to that vehicle. This notification shall be transmitted in a manner consistent with NHTSA safety notification requirements published in 40 CFR 568.

Subpart B—Emission Regulations for 1977 and Later Model Year New Light-Duty Vehicles and New Light-Duty Trucks; Test Procedures.

§ 86.101 General applicability.

(a) The provisions of this subpart are applicable to 1977 and later model year new light-duty vehicles and light-duty trucks.

(1) Sections 86.101 through 86.145–78 apply for 1978 and later model years.

(2) Sections 86.177–4 through 86.177–23 apply for the 1977 model year only.

(b) Provisions of this subpart apply to tests performed by both the Administrator and motor vehicle manufacturers.

§ 86.102 Definitions.

The definitions in §§ 86.077–2 and 86.078–2 apply to this subpart.

§ 86.103 Abbreviations.

The abbreviations in § 86.078–3 apply to this subpart.

§ 86.104–78 Section numbering; construction.

(a) The model year of initial applicability is indicated by the section number. The two digits following the hyphen designate the first model year for which a section is effective. A section remains effective until superseded.

Example. Section 86.111–78 applies to the 1978 and subsequent model years until superseded. If a § 86.111–81 is promulgated it would take effect beginning with the 1981 model year; § 86.111–78 would apply to model years 1978 through 1980.

(b) Unless indicated otherwise, all provisions in this subpart apply to both gasoline-fueled and Diesel vehicles.

§ 86.105–78 Introduction; structure of subpart.

(a) This subpart describes the equipment required and the procedures to follow in order to perform exhaust and evaporative emission tests on light-duty vehicles and light-duty trucks. Subpart A sets forth the testing requirements and test intervals necessary to comply with EPA certification procedures.

(b) Three topics are addressed in this subpart. Sections 86.106 through 86.115 set forth specifications and equipment requirements; §§ 86.116 through 86.126 discuss calibration methods and frequency; test procedures and data requirements are listed (in approximate order of performance) in §§ 86.127 through 86.145.

§ 86.106–78 Equipment required; overview.

(a) This subpart contains procedures for both exhaust and evaporative emissions tests on Diesel or gasoline-fueled light-duty vehicles and light-duty trucks. Certain items of equipment are not necessary for a particular test, e.g., evaporative enclosure when testing Diesel vehicles. Equipment required and specifications are as follows:

(1) *Evaporative emission tests; gasoline-fueled vehicles.* The evaporative emission test is closely related to and connected with the exhaust emission test. All vehicles tested for evaporative emissions must be tested for exhaust emissions. Further, unless the evaporative emission test is waived by the Administrator under § 86.078–26, all gasoline-fueled vehicles must undergo both tests. (Diesel vehicles are excluded from the evaporative emission standard.) Section 86.107 specifies the necessary equipment.

(2) *Exhaust emission tests.* All vehicles subject to this subpart are tested for exhaust emissions. Diesel and gasoline-fueled vehicles are tested identically with the exception of hydrocarbon measurements; Diesel vehicles require a heated hydrocarbon detector, § 86.109. All gasoline-fueled vehicles are either tested for evaporative emissions or undergo a diurnal heat build, Diesel vehicles are excluded from this requirement. Equipment necessary and specifications appear in §§ 86.108 through 86.114.

(3) *Fuel, analytical gas, and driving schedule specifications.* Fuel specifications for exhaust and evaporative emis-

sion testing and for mileage accumulation for gasoline-fueled and Diesel vehicles are specified in § 86.113. Analytical gases are specified in § 86.114. The EPA Urban Dynamometer Driving Schedule for use in exhaust testing is specified in § 86.115 and Appendix I.

§ 86.107–78 Sampling and analytical system; evaporative emissions.

(a) Component description (evaporative emissions sampling system). The following components will be used in evaporative emissions sampling systems for testing under this subpart.

(1) *Evaporative emission measurement enclosure.* The enclosure shall be readily sealable, rectangular in shape, with space for personnel access to all sides of the vehicle. When sealed, the enclosure shall be gas tight in accordance with § 86.117. Interior surfaces must be impermeable to hydrocarbons. One surface should be of flexible, impermeable material to allow for minor volume changes, resulting from temperature changes. Wall design should promote maximum dissipation of heat, and if artificial cooling is used, interior surface temperatures shall not be less than 68° F (20° C).

(2) *Evaporative emission hydrocarbon analyzers.* A hydrocarbon analyzer utilizing the hydrogen flame ionization principle (FID) shall be used to monitor the atmosphere within the enclosure. Instrument bypass flow may be returned to the enclosure. The FID shall have a response time to 90 percent of final reading of less than 1.5 seconds, and be capable of meeting performance requirements expressed as a function of C_{etc}: where C_{etc} is the specific enclosure hydrocarbon level, in ppm, corresponding to the evaporative emission standard:

(i) Stability of the analyzer shall be better than 0.01 C_{etc} ppm at zero and span over a 15-minute period on all ranges used.

(ii) Repeatability of the analyzer, expressed as one standard deviation, shall be better than 0.005 C_{etc} ppm on all ranges used.

(3) *Evaporative emission hydrocarbon data recording system.* The electrical output of the FID shall be recorded at least at the initiation and termination of each diurnal or hot soak. The recording may be by means of a strip chart potentiometric recorder, by use of an on-line computer system or other suitable means. In any case, the recording system must have operational characteristics (signal to noise ratio, speed of response, etc.) equivalent to or better than those of the signal source being recorded, and must provide a permanent record of results. The record shall show a positive indication of the initiation and completion of each diurnal or hot soak along with the time elapsed between initiation and completion of each soak.

(4) *Tank fuel heating system.* The tank fuel heating system shall consist of a heat source and a temperature controller. A typical heat source is a 2000 W heating pad. Other sources may be used as required by circumstances. The temperature controller may be manual, such as a variable voltage transformer, or may be automated. The heating system must not cause hot spots on the tank wetted surface which could cause local overheating of the fuel. Heat must not be applied to the vapor in the tank above the liquid fuel. The temperature controller must be capable of controlling the fuel tank temperature during the diurnal soak to within ±3° F (1.7° C) of the following equation:

$$F = T_o + 0.4\ t$$

or for SI units:

$$C = T_o + (2/9)t$$

Where:

F = Temperature in °F
C = Temperature in °C
t = Time since start of test in minutes
T_o = Initial temperature

(5) *Temperature recording system.* Strip chart recorder(s) or automatic data processor shall be used to record enclosure ambient and vehicle fuel tank temperature during the evaporative emissions test. The temperature recorder or data processor shall record each temperature at least once every minute. The recording system shall be capable of resolving time to ±15s and capable of resolving temperature to ±0.75° F. (0.42° C). The temperature recording system (recorder and sensor) shall have an accuracy of ±3° F (1.7° C). The recorder (data processor) shall have a time accuracy of ±15s and a precision of ±15s. Two ambient temperature sensors, connected to provide one average output, shall be located in the enclosure. These sensors shall be located at the approximate vertical centerline of each side wall extending 4 inches (nominally) into the enclosure at a height of 3±0.5 ft (0.9±0.2 m). The vehicle fuel tank temperature sensor shall be located in the fuel tank so as to measure the temperature of the prescribed test fuel at the approximate mid-volume of the fuel. Manufacturers shall arrange that vehicles furnished for testing at Federal certification facilities be equipped with iron-constantan Type J thermocouples for measurement of fuel tank temperature.

(6) *Purge blower.* One or more portable or fixed blowers shall be used to purge the enclosure. The blowers shall have sufficient flow capacity to reduce the enclosure hydrocarbon concentration from the test level to the ambient level between tests. Actual flow capacity will depend upon the time available between tests.

(7) *Mixing blower.* One or more small blowers or fans with a total capacity of 200 to 1000 cfm shall be used to mix the contents of the enclosure during evaporative emission testing. No portion of the air stream shall be directed towards the vehicle. Maintenance of uniform concentrations throughout the enclosure is important to the accuracy of the test.

§ 86.108–78 Dynamometer.

The dynamometer shall have a power absorption unit for simulation of road load power and flywheels or other means of simulating the inertia weight as specified in § 86.129.

§ 86.109–78 Exhaust gas sampling system.

(a) (1) *General.* The exhaust gas sampling system is designed to measure the true mass emissions of vehicle exhaust. In the CVS concept of measuring mass emissions, two conditions must be satisfied; the total volume of the mixture of exhaust and dilution air must be measured, and a continuously proportioned sample of volume must be collected for analysis. Mass emissions are determined from the sample concentration and totalized flow over the test period.

(2) *Positive Displacement Pump.* The Positive Displacement Pump-Constant Volume Sampler (PDP–CVS), Figure B78–1, satisfies the first condition by metering at a constant temperature and pressure through the pump. The total volume is measured by counting the revolutions made by the calibrated positive displacement pump. The proportional sample is achieved by sampling at a constant flow rate.

(3) *Critical Flow Venturi.* The operation of the Critical Flow Venturi-Constant Volume Sample (CFV–CVS), Figure B78–2, is based upon the principles of fluid dynamics associated with critical flow. Proportional sampling throughout temperature excursions is maintained by use of a small CFV in the sample line. The variable mixture flow rate is maintained at sonic velocity, which is directly proportional to the square root of the gas temperature, and is computed continuously. Since the pressure and temperature are the same at both venturi inlets, the sample volume is proportional to the total volume.

(4) *Diesel sampling.* Diesel vehicles require a heated flame ionization detector (HFID) for hydrocarbon analysis. The sample must be taken as close as practical to the mixing point of the dilution air and exhaust sample. The HFID, by design, draws its sample at a constant flow rate. Unless compensation for varying flow is made the HFID must be used with a constant flow system to insure a representative sample.

(5) *Other systems.* Other sampling systems may be used if shown to yield equivalent results, and if approved in advance by the Administrator (e.g., a heat exchanger with the CFV–CVS; an electronic flow integrator without a heat exchanger, with the PDP–CVS; or, for Diesel HC measurements, an electronic flow compensator with the CFV–CVS).

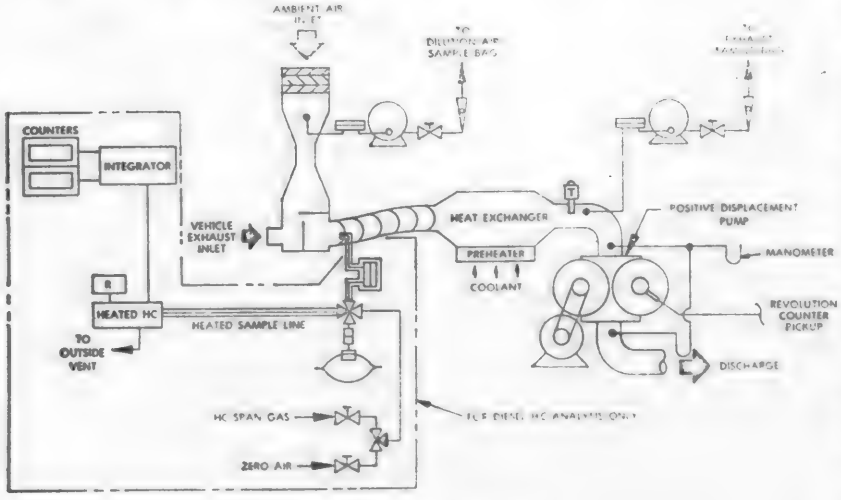
(b) *Component description, PDP–CVS.* The PDP–CVS, Figure B78–1, consists of a dilution air filter and mixing assembly, heat exchanger, positive displacement pump, sampling system, and associated valves, pressure and temperature sensors. The PDP–CVS shall conform to the following requirements:

(1) Static pressure variations at the tailpipe(s) of the vehicle shall remain within ±5 inches of water (1.2 kPa) of the static pressure variations measured during a dynamometer driving cycle with no connection to the tailpipe(s). (Sampling systems capable of maintaining the static pressure to within ±1 inch of water (0.25 kPa) will be used by the Administrator if a written request substantiates the need for this closer tolerance.)

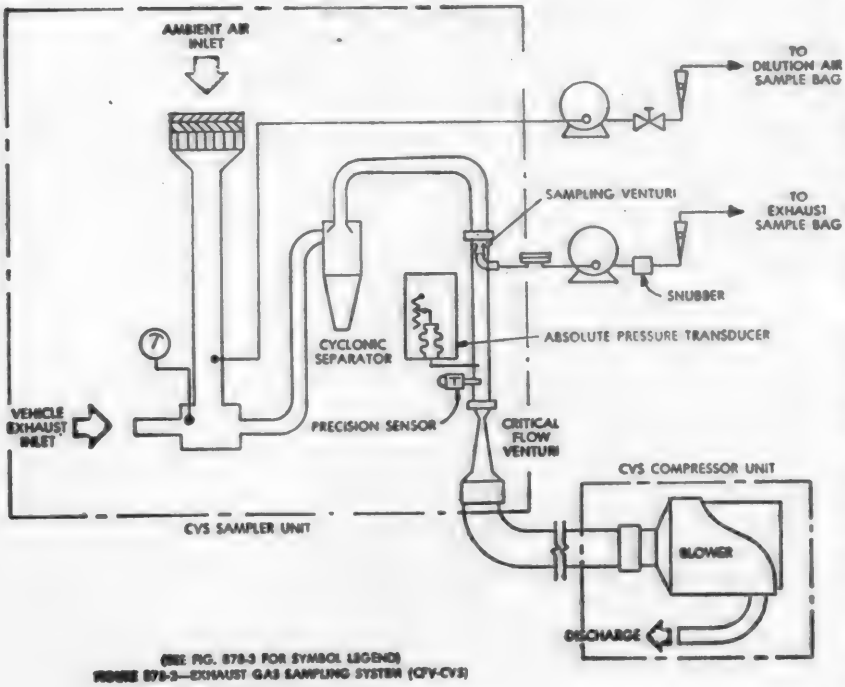
(2) The gas mixture temperature, measured at a point immediately ahead of the positive displacement pump, shall be within ±10° F (5.6° C) of the designed operating temperature at the start of the test. The gas mixture temperature variation from its value at the start of the test shall be limited to ±10° F (5.6° C) during the entire test. The temperature measuring system shall have an accuracy and precision of ±2° F (1.1° C).

(3) The pressure gauges shall have an accuracy and precision of ±3 mm Hg (0.4 kPa).

(4) The flow capacity of the CVS shall be large enough to eliminate water condensation in the system (300 to 350 cfm, 0.140 to 0.165 m^3/s, is sufficient for most vehicles).



(SEE FIG. B78-3 FOR SYMBOL LEGEND)
FIGURE B78-1—EXHAUST GAS SAMPLING SYSTEM (FDF-CVS)



(SEE FIG. B78-3 FOR SYMBOL LEGEND)
FIGURE B78-2—EXHAUST GAS SAMPLING SYSTEM (CFV-CVS)

(5) Sample collection bags for dilution air and exhaust samples shall be of sufficient size so as not to impede sample flow.

(c) *Component description, CFV–CVS.* The CFV–CVS, Figure B78–2 consists of a dilution air filter and mixing assembly, cyclone particulate separator, sampling venturi, critical flow venturi, sampling system, and assorted valves, pressure and temperature sensors. The CFV–CVS shall conform to the following requirements:

(1) Static pressure variations at the tailpipe(s) of the vehicle shall remain within ±5 inches of water (1.2 kPa) of the static pressure variations measured during a dynamometer driving cycle with no connection to the tailpipe(s). (Sampling systems capable of maintaining the static pressure to within ±1 inch of water (0.25 kPa) will be used by the Administrator if a written request substantiates the need for this closer tolerance.)

(2) The temperature measuring system shall have an accuracy and precision of ±2° F (1.1° C) and a response time of 0.100 seconds to 62.5 percent of a temperature change (as measured in hot silicone oil).

(3) The pressure measuring system shall have an accuracy and precision of ±3 mm Hg (0.4 kPa).

(4) The flow capacity of the CVS shall be large enough to virtually eliminate water condensation in the system (300 to 350 cfm, 0.142 to 0.165 m^3/s, is sufficient for most vehicles).

(5) Sample collection bags for dilution air and exhaust samples shall be of sufficient size so as not to impede sample flow.

§ 86.110–78 [Reserved]

§ 86.111–78 Exhaust gas analytical system.

(a) *Schematic drawings.* Figure B78–3 is a schematic drawing of the exhaust gas analytical system. The schematic of the hydrocarbon analysis train for Diesel vehicles is shown as part of Figure B78–1. Since various configurations can produce accurate results, exact conformance with either drawing is not required. Additional components such as instruments, valves, solenoids, pumps and switches may be used to provide additional information and coordinate the functions of the component systems.

(b) *Major component description.* The analytical system, Figure B78–3, consists of a flame ionization detector (FID) for the determination of hydrocarbons, nondispersive infrared analyzers (NDIR) for the determination of carbon monoxide and carbon dioxide and a chemiluminescence analyzer (CL) for the determination of oxides of nitrogen. A heated flame ionization detector (HFID) is used for the continuous determination of hydrocarbons from Diesel fueled vehicles, Figure B78–1. The exhaust gas analytical system shall conform to the following requirements:

(1) The CL requires that the nitrogen dioxide present in the sample be con-

verted to nitric oxide before analysis. Other types of analyzers may be used if shown to yield equivalent results and if approved in advance by the Administrator.

(2) The carbon monoxide (NDIR) analyzer may require a sample conditioning column containing $CaSO_4$, or indicating silica gel to remove water vapor and containing ascarite to remove carbon dioxide from the CO analysis stream.

(i) If CO instruments which are essentially free of CO_2 and water vapor interference are used, the use of the conditioning column may be deleted, see §§ 86.-122 and 86.144.

(ii) A CO instrument will be considered to be essentially free of CO_2 and water vapor interference if its response to a mixture of 3 percent CO_2 in N_2 which has been bubbled through water at room temperature produces an equivalent CO response, as measured on the most sensi-

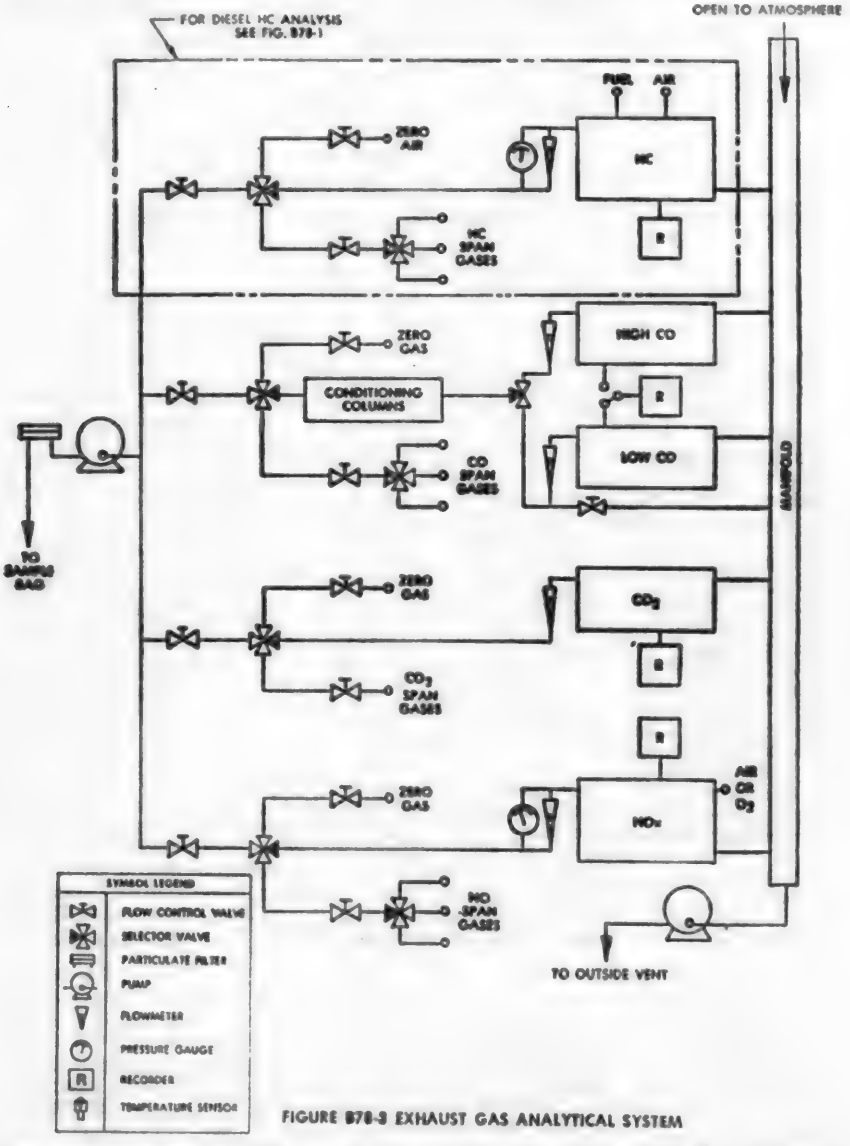


FIGURE B78-3 EXHAUST GAS ANALYTICAL SYSTEM

tive CO range, which is less than 1 percent of full scale CO concentration on ranges above 300 ppm full scale or less than 3 ppm on ranges below 300 ppm full scale, see § 86.122.

(3) For Diesel vehicles a continuous sample shall be measured using a heated analyzer train as shown in Figure B78–1. The train shall include a heated continuous sampling line, a heated particulate filter, and a heated hydrocarbon instrument (HFID) complete with heated pump, filter and flow control system.

(i) The response time of this instrument shall be less than 1.5 seconds for 90 percent of full-scale response.

(ii) Sample transport time from sampling point to inlet of instrument shall be less than 4 seconds.

(iii) The sample line and filter shall be heated to a set point ±10° F (±5.6° C) between 300 and 390° F (149 and 199° C).

(c) *Other analyzers and equipment.* Other types of analyzers and equipment may be used if shown to yield equivalent results and if approved in advance by the Administrator.

§ 86.112–78 [Reserved]

§ 86.113–78 Fuel specifications.

(a) *Gasoline.* (1) Gasoline having the following specifications will be used by the Administrator in exhaust and evaporative emission testing. Gasoline having the following specifications or substantially equivalent specifications approved by the Administrator, shall be used by the manufacturer in exhaust and evaporative testing, except that the lead and octane specifications do not apply.

Item	ASTM	Leaded	Unleaded
Octane, research, minimum	D2699	100	96
Pb. (organic), grams/U.S. gallon		[1] 1.4	0.00–0.05
Distillation range:			
IBP [2], °F	D86	75–95	75–95
10 pct point, °F	D86	120–135	120–135
50 pct point, °F	D86	200–230	200–230
90 pct point, °F	D86	300–325	300–325
EP, °F (maximum)	D86	415	415
Sulphur, weight percent, maximum	D1266	0.10	0.10
Phosphorous, grams/U.S. gallon, maximum		0.01	0.005
RVP [3] [4], per square inch	D323	8.7–9.2	8.7–9.2
Hydrocarbon composition:			
Olefins, percent, maximum	D1319	10	10
Aeromatics, percent, maximum	D1319	35	35
Saturates	D1319	[5]	[5]

[1] Minimum.
[2] For testing at altitudes above 1,219 m (4,000 ft) the specified range is 75–105.
[3] For testing which is unrelated to evaporative emission control, the specified range is 8.0–9.2.
[4] For testing at altitudes above 1,219 m (4,000 ft) the specified range is 7.9–9.2.
[5] Remainder.

(2) Gasoline representative of commercial gasoline which will be generally available through retail outlets shall be used in service accumulation. For leaded gasoline the minimum lead content shall be 1.4 grams per U.S. gallon, except that where the Administrator determines that vehicles represented by a test vehicle will be operated using gasoline of different lead content than that prescribed in this paragraph, he may consent in writing to use of a gasoline with a different lead content. The octane rating of the gasoline used shall be no higher than 4.0 research octane numbers above the minimum recommended by the manufacturer. The Reid Vapor Pressure of the gasoline used shall be characteristic of the motor fuel used during the season in which the service accumulation takes place.

(3) The specification range of the gasoline to be used under paragraph (a) (2) of this section shall be reported in accordance with § 86.078–21(b) (3).

(b) *Diesel fuel.* (1) The Diesel fuels employed for testing shall be clean and bright, with pour and cloud points adequate for operability. The Diesel fuel may contain nonmetallic additives as follows: Centane improver, metal deactivator, antioxidant, dehazer, antirust, pour depressant, dye, and dispersant.

(2) Diesel fuel meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in exhaust emissions testing. The grade of Diesel fuel recommended by the engine manufacturer commercially designated as "Type 2D" grade Diesel fuel shall be used.

Item	ASTM test method No.	Type 2-D
Cetane	D613	42–50
Distillation range	D86	
IBP, °F		340–400
10 pct point, °F		400–460
50 pct point, °F		470–540
90 pct point, °F		550–610
EP, °F		580–660
Gravity, °API	D287	33–37
Total sulfur, percent	D129 or D2622	0.2–0.5
Hydrocarbon composition	D1319	
Aromatics, percent (minimum).		27
Paraffins, naphthenes, olefins.		Remainder
Flashpoint °F (minimum)	D93	130
Viscosity, centistokes	D445	2.0–3.2

(3) Diesel fuel meeting the following specifications, or substantially equivalent specifications approved by the Administractor, shall be used in service accumulation. The grade of Diesel fuel recommended by the engine manufacturer, commercially designated as "Type 2-D" grade Diesel fuel shall be used.

Item	ASTM test method No.	Type 2-D
Cetane (minimum)	D613	38–58
Distillation range:		
90 percent point, °F	D86	430–630
Gravity °API	D287	30–42
Total sulfur, percent (minimum).	D129 or D2622	0.2
Flashpoint, °F (minimum)	D93	130
Viscosity, centistokes	D455	1.5–4.5

(4) Other petroleum distillate fuel specifications:

(i) Other petroleum distillate fuels may be used for testing and service accumulation provided they are commercially available, and

(ii) Information, acceptable to the Administrator, is provided to show that only the designated fuel would be used in customer service, and

(iii) Use of a fuel listed under paragraphs (b) (2) and (b) (3) of this section would have a detrimental effect on emissions or durability, and

(iv) Written approval from the Administrator of the fuel specifications must be provided prior to the start of testing.

(5) The specification range of the fuels to be used under paragraphs (b) (2), (b) (3), and (b) (4) of this section shall be reported in accordance with § 86.078–21(b) (3).

§ 86.114–78 Analytical gases.

(a) Analyzer gases.

(1) Gases for the CO and CO_2 analyzers shall be single blends of CO and CO_2 respectively using nitrogen as the diluent.

(2) Gases for the hydrocarbon analyzer shall be single blends of propane using air as the diluent.

(3) Gases for the NO_x analyzer shall be single blends of NO named as NO_x with a maximum NO_2 concentration of 5 percent of the nominal value using nitrogen as the diluent.

(4) Fuel for the evaporative emission enclosure FID shall be a blend of 40 ±2 percent hydrogen with the balance being helium. The mixture shall contain less than 1 ppm equivalent carbon response. 98 to 100 percent hydrogen fuel may be used with advance approval by the Administrator.

(5) The allowable zero gas (air or nitrogen) impurity concentrations shall not exceed 1 ppm equivalent carbon response, 1 ppm carbon monoxide, 0.04 percent (400 ppm) carbon dioxide and 0.1 ppm nitric oxide.

(6) "Zero-grade air" includes artificial "air" consisting of a blend of nitrogen and oxygen with oxygen concentrations between 18 and 21 mole percent.

(7) The use of proportioning and precision blending devices to obtain the required analyzer gas concentrations is allowable provided their use has been approved in advance by the Administrator.

(b) Calibration gases should be known to within ±2 percent of the true values.

§ 86.114–79 Analytical gases.

(a) Analyzer gases.

(1) Gases for the CO and CO_2 analyzers shall be single blends of CO and CO_2 respectively using nitrogen as the diluent.

(2) Gases for the hydrocarbon analyzer shall be single blends of propane using air as the diluent.

(3) Gases for NOx analyzer shall be single blends of NO named as NOx, with a maximum NO_2 concentration of 5 percent of the nominal value, using nitrogen as the dilutent.

(4) Fuel for the evaporative emission enclosure FID shall be a blend of 40±2% hydrogen with the balance being helium. The mixture shall contain less than 1

ppm equivalent carbon response. 98 to 100 percent hydrogen fuel may be used with advance approval by the Administrator.

(5) The allowable zero gas (air or nitrogen) impurity concentrations shall not exceed 1 ppm equivalent carbon response, 1 ppm carbon monoxide, 0.04 percent (400 ppm) carbon dioxide and 0.1 ppm nitric oxide.

(6) "Zero grade air" includes artificial "air" consisting of a blend of nitrogen and oxygen with oxygen concentrations between 18 and 21 mole percent.

(b) Calibration gases shall be traceable to within 1 percent of NBS gas standards, or other gas standards which have been approved by the Administrator.

(c) Span gases shall be accurate to within 2 percent of true concentration, where true concentration refers to NBS gas standards, or other gas standards which have been approved by the Administrator.

§ 86.115–78 EPA urban dynamometer driving schedule.

(a) The dynamometer driving schedule is listed in Appendix I. The driving schedule is defined by a smooth trace drawn through the specified speed vs. time relationships. It consists of a nonrepetitive series of idle, acceleration, cruise, and deceleration modes of various time sequences and rates.

(b) The speed tolerance at any given time on the dynamometer driving schedule prescribed in Appendix I or as printed on a driver's aid chart approved by the Administrator, when conducted to meet the requirements of § 86.137 is defined by upper and lower limits. The upper limit is 2 mph (3.2 km/h) higher than the highest point on the trace within 1 second of the given time. The lower limit is 2 mph (3.2 km/h) lower than the lowest point on the trace within 1 second of the given time. Speed variations greater than the tolerances (such as may occur during gear changes) are acceptable provided they occur for less than 2 seconds on any occasion. Speeds lower than those prescribed are acceptable provided the vehicle is operated at maximum available power during such occurrences. When conducted to meet the requirements of § 86.128 the speed tolerance shall be as specified above, except that the upper and lower limits shall be 4 mph (6.4 km/h).

(c) Figures B78–4(a) and B78–4(b) show the range of acceptable speed tolerances for typical points. Figure B78–4 (a) is typical of portions of the speed curve which are increasing or decreasing throughout the two second time interval. Figure B78–4(b) is typical of portions of the speed curve which include a maximum or minimum value.

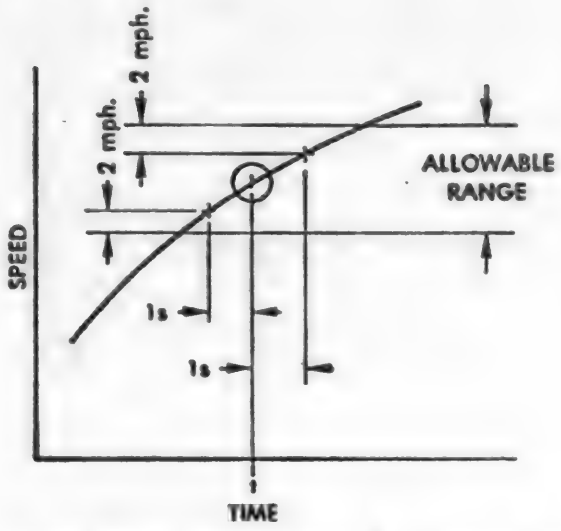


FIGURE B78-4a—DRIVERS TRACE, ALLOWABLE RANGE

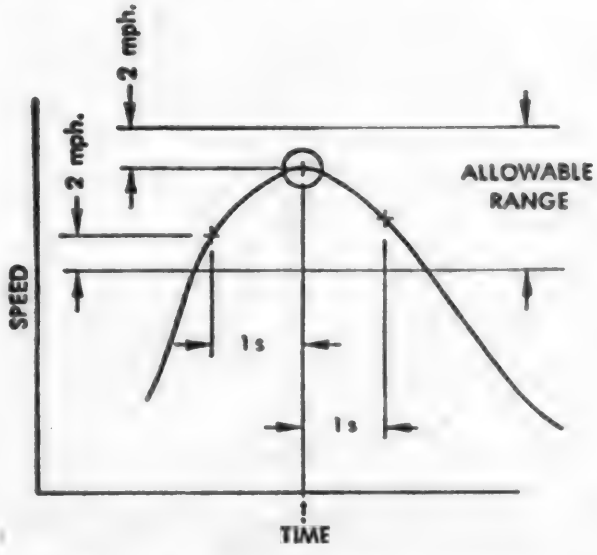


FIGURE B78-4b—DRIVERS TRACE, ALLOWABLE RANGE

§ 86.116–78 Calibrations; frequency and overview.

(a) Calibrations shall be performed as specified in §§ 86.117 through 86.126.

(b) At least yearly or after any maintenance which could alter background emission levels, enclosure background emission measurements shall be performed.

(c) At least monthly or after any maintenance which could alter calibration, the following calibrations and checks shall be performed:

(1) Calibrate the hydrocarbon analyzers (both evaporative and exhaust instruments), carbon dioxide analyzer, carbon monoxide analyzer, and oxides of nitrogen analyzer.

(2) Calibrate the dynamometer. If the dynamometer receives a weekly performance check (and remains within calibration) the monthly calibration need not be performed.

(3) Perform a hydrocarbon retention check and calibration on the evaporative emission enclosure.

(d) At least weekly or after any maintenance which could alter calibration, the following calibrations and checks shall be performed:

(1) Check the oxides of nitrogen converter efficiency, and

(2) Perform a CVS system verification, and

(3) Run a performance check on the dynamometer. This check may be omitted if the dynamometer has been calibrated within the preceding month.

(e) The CVS positive displacement pump or Critical Flow Venturi shall be calibrated following initial installation, major maintenance or as necessary when indicated by the CVS system verification (described in § 86.119).

(f) Sample conditioning columns, if used in the CO analyzer train, should be checked at a frequency consistent with observed column life or when the indicator of the column packing begins to show deterioration.

§ 86.117–78 Evaporative emission enclosure calibrations.

The calibration of the evaporative emission enclosure consists of three parts: Initial and periodic determination of enclosure background emissions; initial determination of enclosure internal volume; and periodic hydrocarbon retention check and calibration.

(a) *Initial and periodic determination of enclosure background emissions.* Prior to its introduction into service, annually thereafter, and after any repair which can affect the enclosure background emissions, the enclosure shall be checked to determine that it does not contain materials which will themselves emit hydrocarbons. Proceed as follows:

(1) Zero and span (calibrate if required) the hydrocarbon analyzer.

(2) Purge the enclosure until a stable background hydrocarbon reading is obtained.

(3) Turn on the mixing blower (if not already on).

(4) Seal enclosure and measure background hydrocarbon concentration, temperature, and barometric pressure. These are the initial readings C_{HCi}, T_i and P_{Bi} for the enclosure background determination.

(5) Allow the enclosure to stand undisturbed without sampling for four hours.

(6) Measure the hydrocarbon concentration on the same FID. This is the final concentration, C_{HCf}. Also measure final temperature and barometric pressure.

(7) Calculate the mass change of hydrocarbons in the enclosure according to the equations in paragraph (d) of this section. The enclosure background emissions shall not be greater than 0.4g for the 4 hours.

(b) *Initial determination of enclosure internal volume.* Prior to its introduction into service the enclosure internal volume shall be determined by the following procedure.

(1) Carefully measure the internal length, width and height of the enclosure, accounting for irregularities (such as braces) and calculate the internal volume.

(2) Perform an enclosure calibration check according to subparagraphs (1) through (7) of paragraph (c) of this section.

(3) If the calculated mass does not agree within 2 percent of the injected propane mass, then corrective action is required.

(c) *Hydrocarbon retention check and calibration.* The hydrocarbon retention check provides a check upon the calculated volume and also measures the leak rate. Prior to its introduction into service and at least monthly thereafter the enclosure leak rate shall be determined as follows:

(1) Zero and span (calibrate if required) the hydrocarbon analyzer.

(2) Purge the enclosure until a stable background hydrocarbon reading is obtained.

(3) Turn on the mixing blower (if not already on).

(4) Seal enclosure and measure background hydrocarbon concentration, temperature and barometric pressure. These are the initial readings C_{HCi}, T_i and P_{Bi} for the enclosure calibration.

(5) Inject into the enclosure a known quantity of pure propane. (4 g is a convenient quantity.) The propane may be measured by volume flow or by mass measurement. The method used to measure the propane shall have an accuracy and precision of ±0.5 percent of the measured value.

(6) After a minimum of 5 minutes of mixing, analyze the enclosure atmosphere for hydrocarbon content, also record temperature and pressure. These measurements are the final readings for the enclosure calibration as well as the initial readings for the retention check.

(7) To verify the enclosure calibration calculate the mass of propane using the measurements taken in steps (4) and (6). See paragraph (d) of this section. This quantity must be within ±2 percent of that measured in step 5 above.

(8) Allow the enclosure to remain sealed for a minimum of 4 hours without sampling and with the mixing blower operating. After 4 hours analyze the enclosure atmosphere for hydrocarbon content; record temperature and barometric pressure. These are the final readings for the hydrocarbon retention check.

(9) Calculate, using the equations in paragraph (d) and the readings taken in (8), the hydrocarbon mass. It may not differ by more than 4 percent of the value in step (6).

(d) *Calculations.* The calculation of net hydrocarbon mass change is used to determine enclosure background and leak rate. It is also used to check the enclosure volume measurements. The mass change is calculated from the initial and final readings of hydrocarbon concentration, temperature and pressure according to the following equation:

$$M_{HC} = kV \times 10^{-4} \left[\frac{C_{HCf} P_{Bf}}{T_f} - \frac{C_{HCi} P_{Bi}}{T_i} \right]$$

Where:

M_{HC} = Hydrocarbon mass change, g.
C_{HC} = Hydrocarbon concentration as ppm carbon.
V = Enclosure volume, ft^3 (m^3), as measured in paragraph (b)(1) of this section.
P_B = Barometric pressure, in. Hg (kPa).
T = Enclosure ambient temperature, R(K).
$k = 3.05$.

for SI units,

$k = 17.60$.
i = Indicates initial reading.
f = Indicates final reading.

NOTE: Hydrocarbon concentration is stated in ppm carbon, that is, ppm propane x3. Expressions in parenthesis are for SI units.

§ 86.118–78 Dynamometer calibration.

(a) The dynamometer shall be calibrated at least once each month or performance verified at least once each week and then calibrated as required. The calibration shall consist of the manufacturer's recommended calibration procedure plus a determination of the dynamometer frictional power absorption at 50.0 mph (80.5 km/h). One method for determining dynamometer frictional power absorption at 50.0 mph (80.5 km/h) is described below, other methods may be used if shown to yield equivalent results. The measured absorbed road power includes the dynamometer friction as well as the power absorbed by the power absorption unit. The dynamometer is driven above the test speed range. The device used to drive the dynamometer is then disengaged from the dynamometer and the roll(s) is (are) allowed to coast down. The kinetic energy of the system is dissipated by the dynamometer. This method neglects the variations in roll bearing friction due to the drive axle weight of the vehicle. The inertia of the free (rear) roll may be neglected in the case of dynamometers with paired rolls.

(1) Devise a method to determine the speed of the drive roll if it is not already measured. A fifth wheel, revolution pickup, or other suitable means may be used.

(2) Place a vehicle on the dynamometer or devise another method of driving the dynamometer.

(3) Engage the inertial flywheel or other inertial simulation system for the most common vehicle mass category for which the dynamometer is used. In addition other vehicle mass categories may be calibrated, if desired.

(4) Drive the dynamometer up to 50.0 mph (80.5 km/h).

(5) Record indicated road power.

(6) Drive the dynamometer up to 60.0 mph (96.9 km/h).

(7) Disengage the device used to drive the dynamometer.

(8) Record the time for the dynamometer drive roll to coastdown from 55.0 mph (88.5 km/h) to 45 mph (72.4 km/h).

(9) Adjust the power absorption unit to a different level.

(10) Repeat steps (4) to (9) above sufficient times to cover the range of road power used.

(11) Calculate absorbed road power (HP_a). See paragraph (c) of this section.

(12) Plot indicated road load power at 50 mph (80.5 km/h) versus road load power at 50 mph (80.5 km/h) as shown in Figure B78–5.

(b) The performance check consists of conducting a dynamometer coastdown at one or more inertia-horsepower settings and comparing the coastdown time to that recorded during the last calibration. If the coastdown times differ by more than 1 s, a new calibration is required.

(c) *Calculations.* The road load power actually absorbed by the dynamometer is calculated from the following equation:

$$HP_a = (1/2)\ (W/32.2)\ (V_1^2 - V_2^2)/550t$$

Where:

HP_a = Power, horsepower (kilowatts)
W = Equivalent inertia, lb (kg)
V_1 = Initial Velocity, ft/s (m/s)
(55 mph = 80.5 km/h = 80.67 ft/s = 24.58 m/s)
V_2 = Final Velocity, ft/s (m/s)
(45 mph = 72.4 km/h = 66 ft/s = 20.11 m/s)
t = elapsed time for rolls to coast from 55 mph to 45 mph (80.5 to 72.4 km/h)

(Expressions in parenthesis are for SI units.) When the coastdown is from 55 to 45 mph (80.5 to 72.4 km/h) the above equation reduces to:

$HP_a = 0.06073\ (W/t)$
for SI units,
$HP_a = 0.09984\ (W/t)$

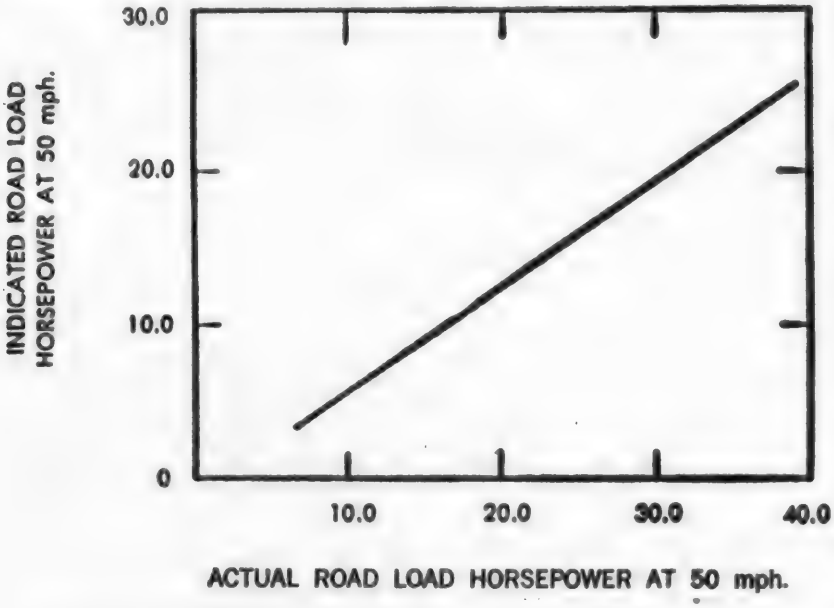


FIGURE B78-5—ROAD LOAD HORSEPOWER, ACTUAL VS. INDICATED

§ 86.119–78 CVS calibration.

The CVS is calibrated using an accurate flowmeter and restrictor valve. Measurements of various parameters are made and related to flow through the unit. Procedures used by EPA for both PDP and CFV are outlined below. Other procedures yielding equivalent results may be used if approved in advance by the Administrator. After the calibration curve has been obtained, verification of the entire system can be performed by injecting a known mass of gas into the system and comparing the mass indicated by the system to the true mass injected. An indicated error does not necessarily mean that the calibration is wrong, since other factors can influence the accuracy of the system, e.g. analyzer calibration. A verification procedure is found in paragraph (c) of this section.

(a) *PDP calibration.* (1) The following calibration procedure outlines the equipment, the test configuration, and the various parameters which must be measured to establish the flow rate of the CVS pump. All the parameters related to the pump are simultaneously measured with the parameters related to a flowmeter which is connected in series with the pump. The calculated flow rate (ft^3/min. (at pump inlet absolute pressure and temperature) can then be plotted versus a correlation function which is the value on a specific combination of pump parameters. The linear equation which relates the pump flow and the correlation function is then determined. In the event that a CVS has a multiple speed drive, a calibration for each range used must be performed.

(2) This calibration procedure is based on the measurement of the absolute values of the pump and flowmeter parameters that relate the flow rate at each point. Three conditions must be maintained to assure the accuracy and integrity of the calibration curve. First, the pump pressures should be measured at taps on the pump rather than at the external piping on the pump inlet and outlet. Pressure taps that are mounted at the top center and bottom center of the pump drive headplate are exposed to the actual pump cavity pressures, and

therefore reflect the absolute pressure differentials. Secondly, temperature stability must be maintained during the calibration. The laminar flowmeter is sensitive to inlet temperature oscillations which cause the data points to be scattered. Gradual changes (±2° F (1.1° C)) in temperature are acceptable as long as they occur over a period of several minutes. Finally, all connections between the flowmeter and the CVS pump must be absolutely void of any leakage.

(3) During an exhaust emission test the measurement of these same pump parameters enables the user to calculate the flow rate from the calibration equation.

(4) Connect a system as shown in Figure B78–6. Although particular types of equipment are shown, other configurations that yield equivalent results may be used if approved in advance by the Administrator. For the system indicated, the following data with given accuracy are required:

CALIBRATION DATA MEASUREMENTS

Parameter	Symbol	Units	Tolerances
Barometric pressure (corrected)	P_B	Inches Hg (kPa).	±.01 in Hg (±.034 kPa).
Ambient temperature	T_A	°F (°C).	±.5°F (±.28°C).
Air temperature into LFE	ETI	°F (°C).	±.25°F (±.14°C).
Pressure depression upstream of LFE	EPI	Inches H_2O (kPa).	±.05 in H_2O (±.012 kPa).
Pressure drop across the LFE matrix	EDP	Inches H_2O (kPa).	±.005 in H_2O (±.001 kPa).
Air temperature at CVS pump inlet	PTI	°F (°C).	±.5°F (±.28°C).
Pressure depression at CVS pump inlet	PPI	Inches fluid (kPa).	±.05 in fluid (±.022 kPa).
Specific gravity of manometer fluid (1.75 oil).	Sp. Gr		
Pressure head at CVS pump outlet	PPO	Inches fluid (kPa).	±.05 in fluid (±.022 kPa).
Air temperature at CVS pump outlet (optional).	PTO	°F (°C).	±.5°F (±.28°C).
Pump revolutions during test period	N	Revs.	±1 Rev.
Elapsed time for test period	t	s.	±.05 s.

(5) After the system has been connected as shown in Figure B78–6, set the variable restrictor in the wide open position and run the CVS pump for 20 minutes. Record the calibration data.

(6) Reset the restrictor valve to a more restricted condition in an increment of pump inlet depression (about 4" H_2O (1.0 kPa) that will yield a minimum of six data points for the total calibration. Allow the system to stabilize for 3 minutes and repeat the data acquisition.

(7) Data analysis:

(i) The air flow rate, Qs, at each test point is calculated in standard cubic feet per minute from the flowmeter data using the manufacturer's prescribed method.

(ii) The air flow rate is then converted to pump flow, V_o, in cubic feet per revolution at absolute pump inlet temperature and pressure.

$$V_o = \frac{Q_s}{n} \times \frac{T_p}{528} \times \frac{29.92}{P_p}$$

Where:

V_o = Pump flow, ft^3/revolution (m^3/revolution) at T_p, P_p

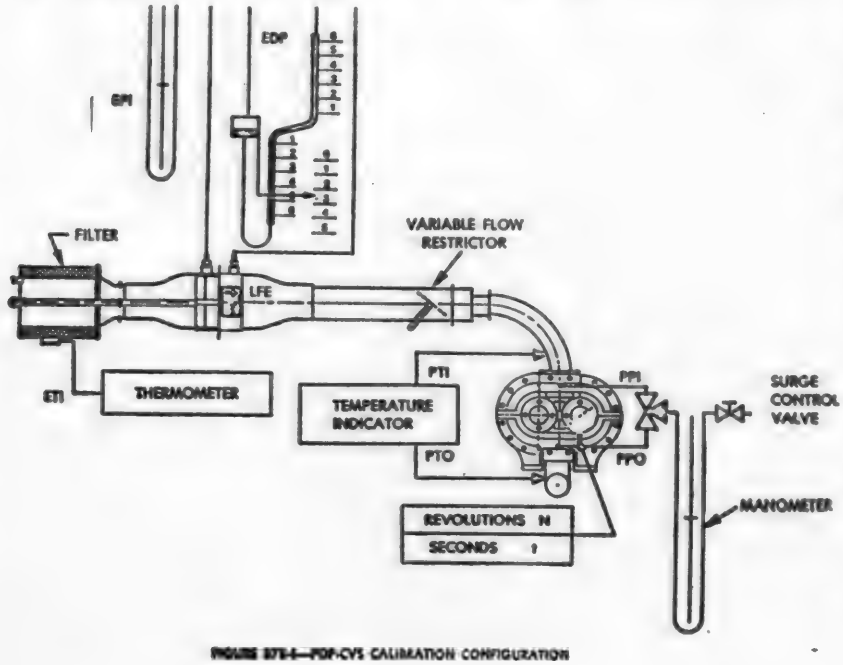


FIGURE B78-6—PDP-CVS CALIBRATION CONFIGURATION

Q_s = Meter air flow rate in standard cubic feet per minute, standard conditions are 68° F, 29.92 in. Hg (20° C, 101.3 kPa).

n = Pump speed in revolutions per minute.

T_p = Pump inlet temperature, R(K) = PTI + 460

for SI units, T_p = PTI + 273

P_p = Absolute pump inlet pressure, in. Hg (kPa) = P_B − PPI (SP. GR./13.57)

for SI units, $P_p = P_B - PPI$

Where:

P_B = barometric pressure, in. Hg (kPa)

PPI = Pump inlet depression, in. fluid (kPa)

SP. GR. = Specific gravity of manometer fluid relative to water.

(iii) The correlation function at each test point is then calculated from the calibration data:

$$X_o = \frac{1}{n}\sqrt{\frac{\Delta P_p}{P_o}}$$

Where:

X_o = correlation function.

ΔP_p = The pressure differential from pump inlet to pump outlet, in. Hg (kPa) = $P_o - P_p$

P_o = Absolute pump outlet pressure, in. Hg (kPa) = P_B + PPO (SP. GR./13.57)

for SI units, $P_o = P_B + PPO$

Where:

PPO = Pressure head at pump outlet, in. fluid (kPa)

(iv) A linear least squares fit is performed to generate the calibration equations which have the forms:

$V_o = D_o - M(X_o)$

$n = A - B(\Delta P_p)$

D_o, M, A, and B are the slope-intercept constants describing the lines.

(8) A CVS system that has multiple speeds should be calibrated on each speed used. The calibration curves generated for the ranges will be approximately parallel and the intercept values, D_o, will increase as the pump flow range decreases.

(9) If the calibration has been performed carefully, the calculated values from the equation will be within ±0.50 percent of the measured value of V_o. Values of M will vary from one pump to another, but values of D_o for pumps of the same make, model, and range should agree within ±3 percent of each other. Particulate influx from use will cause the pump slip to decrease as reflected by lower values for M. Calibrations should be performed at pump start-up and after major maintenance to assure the stability of the pump slip rate. Analysis of mass injection data will also reflect pump slip stability.

(b) *CFV calibration.* (1) Calibration of the CFV is based upon the flow equation for a critical venturi. Gas flow is a function of inlet pressure and temperature:

$$Q_s = \frac{K_v P}{\sqrt{T}}$$

Where:

Q_s = Flow

K_v = Calibration coefficient

P = Absolute pressure

T = Absolute temperature

The calibration procedure described below establishes the value of the calibration coefficient at measured values of pressure, temperature and air flow.

(2) The manufacturer's recommended procedure shall be followed by calibrating electronic portions of the CFV.

(3) Measurements necessary for flow calibration are as follows:

CALIBRATION DATA MEASUREMENTS

Parameter	Symbol	Units	Tolerances
Barometric pressure (corrected)	P_B	Inches Hg (kPa)	±.01 in Hg (±.034 kPa).
Air temperature, flowmeter	ETI	°F (°C).	±.25°F (±.14°C).
Pressure depression upstream of LFE	EPI	Inches H_2O (kPa).	±.05 in H_2O (±.012 kPa).
Pressure drop across LFE matrix	EDP	Inches H_2O (kPa).	±.005 in H_2O (±.001 kPa).
Air flow	Q_s	Ft^3/min. (m^3/min.)	±.5 pct.
CFV inlet depression	PPI	Inches fluid (kPa).	±.05 in fluid (±.022 kPa).
Temperature at venturi inlet	T_v	°F (°C).	±.5°F (±.28°C).
Specific gravity of manometer fluid (1.75 oil).	Sp. Gr.		

(4) Set up equipment as shown in Figure B78–7 and check for leaks. Any leaks between the flow measuring device and the critical flow venturi will seriously affect the accuracy of the calibration.

(5) Set the variable flow restrictor to the open position, start the blower, and allow the system to stabilize. Record data from all instruments.

(6) Vary the flow restrictor and make at least 8 readings across the critical flow range of the venturi.

(7) Data analysis: The data recorded during the calibration are to be used in the following calculations:

(i) The air flow rate, Qs, at each test point is calculated in standard cubic feet per minute from the flow meter data using the manufacturer's prescribed method.

(ii) Calculate values of the calibration coefficient for each test point:

$$K_v = \frac{Q_s\sqrt{T_v}}{P_v}$$

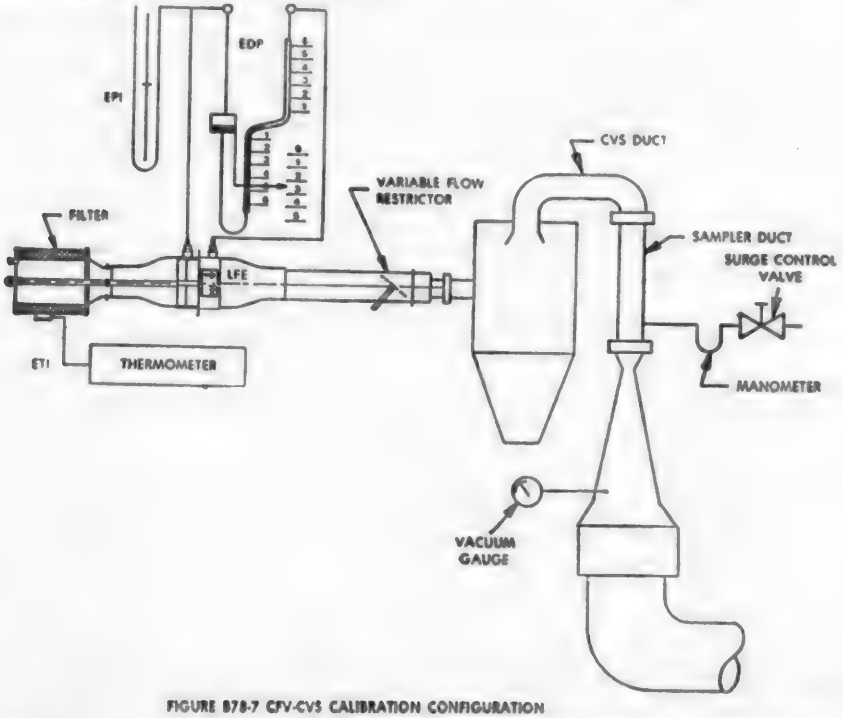


FIGURE B78-7 CFV-CVS CALIBRATION CONFIGURATION

Where:

Q_s=Flow rate in standard cubic feet per minute, standard conditions are 68° F, 29.92 in. Hg (20° C, 101.3 kPa).

T_v=Temperature at venturi inlet, R(K).

P_v=Pressure at venturi inlet, mm Hg (kPa) =P_B−PPI (SP. GR./13.57).

for SI units P_v=P_B−PPI.

Where:

PPI=Venturi inlet pressure depression, in. fluid (kPa).

SP. GR.=Specific gravity of manometer fluid, relative to water.

(iii) Plot K_v as a function of venturi inlet pressure. For sonic flow K_v will have a relatively constant value. As pressure decreases (vacuum increases) the venturi becomes unchoked and K_v decreases. See Figure B78–8.

(iv) For a minimum of 8 points in the critical region calculate an average K_v and the standard deviation.

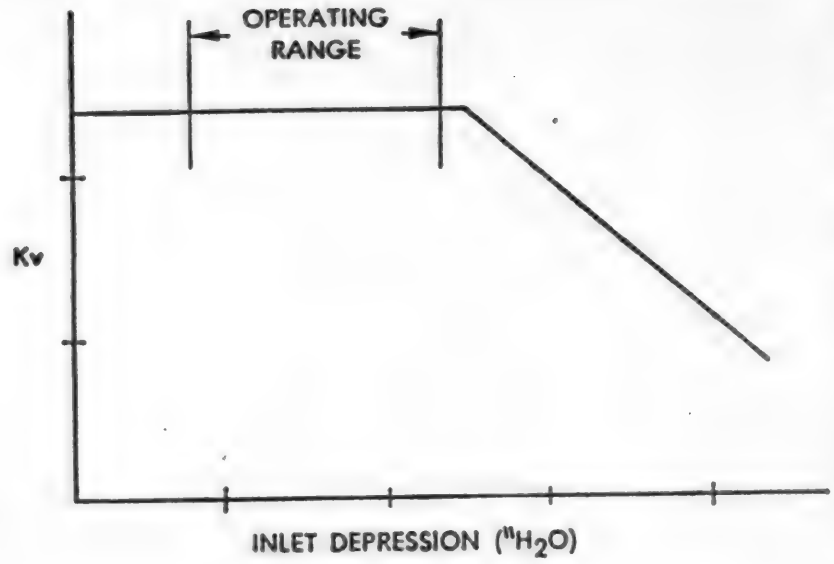


FIGURE B78-8—SONIC FLOW CHOKING

(v) If the standard deviation exceeds 0.3 percent of the average K_v take corrective action.

(c) *CVS System Verification.* The following "gravimetric" technique can be used to verify that the CVS and analytical instruments can accurately measure a mass of gas that has been injected into the system. (Verification can also be accomplished by constant flow metering using critical flow orifice devices.)

(1) Obtain a small cylinder that has been charged with pure propane or carbon monoxide gas (caution—carbon monoxide is poisonous).

(2) Determine a reference cylinder weight to the nearest 0.01 grams.

(3) Operate the CVS in the normal manner and release a quantity of pure propane or carbon monoxide into the system during the sampling period (approximately 5 minutes).

(4) The calculations of § 86.144 are performed in the normal way except, in the case of propane. The density of propane (17.30 g/ft³/carbon atom (0.6109 kg/m³/carbon atom)) is used in place of the density of exhaust hydrocarbons. In the case of carbon monoxide, the density of 32.97 g/ft³ (1.164 kg/m³) is used.

(5) The gravimetric mass is subtracted from the CVS measured mass and then divided by the gravimetric mass to determine the percent accuracy of the system.

(6) The cause for any discrepancy greater than ±2 percent must be found and corrected.

§ 86.120–78 [Reserved]

§ 86.121–78 Hydrocarbon analyzer calibration.

The FID hydrocarbon analyzer shall receive the following initial and periodic calibration. The HFID shall be operated to a set point ±10° F (±5.5° C) between 300 and 390° F (149 and 199° C).

(a) Initial and periodic optimization of detector response. Prior to its introduction into service and at least annually thereafter the FID hydrocarbon analyzer shall be adjusted for optimum hydrocarbon response. Alternate methods yielding equivalent results may be used, if approved in advance by the Administrator.

(1) Follow the manufacturer's instructions for instrument startup and basic operating adjustment using the appropriate fuel and zero-grade air.

(2) Optimize on the most common operating range. Introduce into the analyzer, a propane in air mixture with a propane concentration equal to approximately 90 percent of the most common operating range.

(3) Select an operating fuel flow rate that will give near maximum response and least variation in response with minor fuel flow variations.

(4) To determine the optimum air flow, use the fuel flow setting determined above and vary air flow.

(5) After the optimum flow rates have been determined, they are recorded for future reference.

(b) Initial and periodic calibration. Prior to its introduction into service and monthly thereafter the FID hydrocarbon analyzer shall be calibrated on all normally used instrument ranges. Use the same flow rate as when analyzing samples.

(1) Adjust analyzer to optimize performance.

(2) Zero the hydrocarbon analyzer with zero-grade air.

(3) Calibrate on each normally used operating range with propane in air calibration gases having nominal concentrations of 15, 30, 45, 60, 75, and 90 percent of that range. For each range calibrated, if the deviation from a least-squares best-fit straight line is 2 percent or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2 percent at any point, the best-fit non-linear equation which represents the data to within 2 percent of each test point shall be used to determine concentration.

§ 86.122–78 Carbon monoxide analyzer calibration.

The NDIR carbon monoxide analyzer shall receive the following initial and periodic calibrations:

(a) *Initial and periodic interference check.* Prior to its introduction into service and annually thereafter the NDIR carbon monoxide analyzer shall be checked for response to water vapor and CO_2:

(1) Follow the manufacturer's instructions for instrument startup and operation. Adjust the analyzer to optimize performance on the most sensitive range to be used.

(2) Zero the carbon monoxide analyzer with either zero-grade air or zero-grade nitrogen.

(3) Bubble a mixture of 3 percent CO_2 in N_2 through water at room temperature and record analyzer response.

(4) An analyzer response of more than 1 percent of full scale for ranges above 300 ppm full scale or of more than 3 ppm on ranges below 300 ppm full scale will require corrective action. (Use of conditioning columns is one form of corrective action which may be taken.)

(b) *Initial and periodic calibration.* Prior to its introduction into service and monthly thereafter the NDIR carbon monoxide analyzer shall be calibrated.

(1) Adjust the analyzer to optimize performance.

(2) Zero the carbon monoxide analyzer with either zero-grade air or zero-grade nitrogen.

(3) Calibrate on each normally used operating range with carbon monoxide in N_2 calibration gases having nominal concentrations of 15, 30, 45, 60, 75, and 90 percent of that range. Additional calibration points may be generated. For each range calibrated, if the deviation from a least-squares best-fit straight line is 2 percent or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2 percent at any point, the best-fit non-linear equation which represents the data to within 2 percent of each test point shall be used to determine concentration.

§ 86.123–78 Oxides of nitrogen analyzer calibration.

The chemiluminescent oxides of nitrogen analyzer shall receive the following initial and periodic calibration.

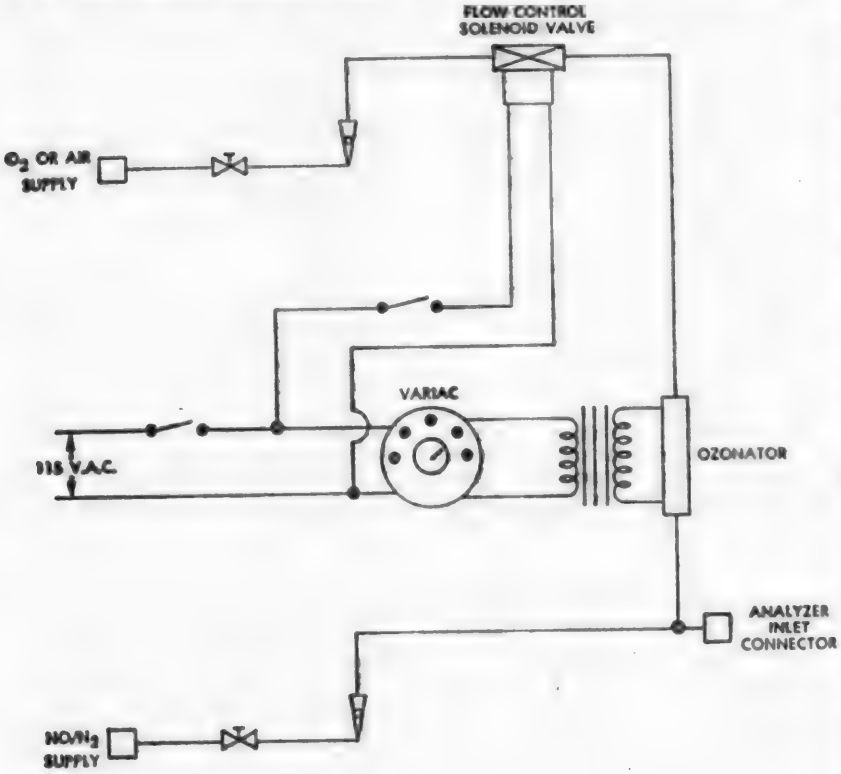
(a) Prior to its introduction into service and weekly thereafter the chemiluminescent oxides of nitrogen analyzer shall be checked for NO_x to NO converter efficiency. Figure B78-9 is a reference for the following steps:

(1) Follow the manufacturer's instructions for instrument startup and operation. Adjust the analyzer to optimize performance.

(2) Zero the oxides of nitrogen analyzer with zero-grade air or zero-grade nitrogen.

(3) Connect the outlet of the NOx generator to the sample inlet of the oxides of nitrogen analyzer which has been set to the most common operating range.

(4) Introduce into the NOx generator analyzer-system an NO in nitrogen (N_2) mixture with an NO concentration equal to approximately 80 percent of the most common operating range. The NO_2 content of the gas mixture shall be less than 5 percent of the NO concentration.



(SEE FIG 878-3 FOR SYMBOL LEGEND)

FIGURE 878-9—NOx CONVERTER EFFICIENCY DETECTOR

(5) With the oxides of nitrogen analyzer in the NO mode, record the concentration of NO indicated by the analyzer.

(6) Turn on the NOx generator O_2 (or air) supply and adjust the O_2 (or air) flow rate so that the NO indicated by the analyzer is about 10 percent less than indicated in step (5). Record the concentration of NO in this NO+O_2 mixture.

(7) Switch the NOx generator to the generation mode and adjust the generation rate so that the NO measured on the analyzer is 20 percent of that measured in step (5). There must be at least 10 percent unreacted NO at this point. Record the concentration of residual NO.

(8) Switch the oxides of nitrogen analyzer to the NOx mode and measure total NOx. Record this value.

(9) Switch off the NOx generation but maintain gas flow through the system. The oxides of nitrogen analyzer will indicate the NOx in the NO+O_2 mixture. Record this value.

(10) Turn off the NOx generator O_2 (or air) supply. The analyzer will now indicate the NOx in the original NO in N_2 mixture. This value should be no more than 5 percent above the value indicated in step (4).

(11) Calculate the efficiency of the NOx converted by substituting the concentrations obtained into the following equation:

$$\text{Percent Eff.} = \left(1 + \frac{a-b}{c-d}\right) \times 100$$

where a=concentration obtained in step (8).
b=concentration obtained in step (9).
c=concentration obtained in step (6).
d=concentration obtained in step (7).

If converter efficiency is not greater than 90 percent corrective action will be required.

(b) Initial and periodic calibration. Prior to its introduction into service and monthly thereafter the chemiluminescent oxides of nitrogen analyzer shall be calibrated on all normally used instrument ranges. Use the same flow rate as when analyzing samples. Proceed as follows:

(1) Adjust analyzer to optimize performance.

(2) Zero the oxides of nitrogen analyzer with zero-grade air or zero-grade nitrogen.

(3) Calibrate on each normally used operating range with NO in N_2 calibration gases having nominal concentrations of 15, 30, 45, 60, 75, and 90 percent of that range. For each range calibrated, if the deviation from a least-squares best-fit straight line is 2 percent or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2 percent at any point, the best-fit non-linear equation which represents the data to within 2 percent of each test point shall be used to determine concentration.

§ 86.124–78 Carbon dioxide analyzer calibration.

Prior to its introduction into service and monthly thereafter the NDIR carbon dioxide analyzer shall be calibrated:

(a) Follow the manufacturer's instructions for instrument startup and operation. Adjust the analyzer to optimize performance.

(b) Zero the carbon dioxide analyzer with either zero-grade air or zero-grade nitrogen.

(c) Calibrate on each normally used operating range with carbon dioxide in N_2 calibration gases with nominal concentrations of 15, 30, 45, 60, 75, and 90 percent of that range. Additional calibration points may be generated. For each range calibrated, if the deviation from a least-squares best-fit straight line is 2 percent or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2 percent at any point, the best-fit non-linear equation which represents the data to within 2 percent of each test point shall be used to determine concentration.

§ 86.125–78 [Reserved]

§ 86.126–78 Calibration of other equipment.

Other test equipment used for testing shall be calibrated as often as required by the manufacturer or as necessary according to good practice.

§ 86.127–78 Test procedures; overview.

The procedures described in this and subsequent sections are used to determine the conformity of vehicles with the standards set forth in Subpart A for light-duty vehicles and light-duty trucks.

(a) The overall test consists of prescribed sequences of fueling, parking, and operating conditions. Vehicles are either tested for only exhaust emissions or are tested for exhaust and evaporative emissions. The evaporative portion of the test procedure occurs before and after the exhaust emission test, and, in some cases, during the exhaust emission test.

(b) The exhaust emission test is designed to determine hydrocarbon, carbon monoxide, and oxides of nitrogen mass emissions while simulating an average trip in an urban area of 7.5 miles

(12.1 km). The test consists of engine startups and vehicle operation on a chassis dynamometer, through a specified driving schedule. A proportional part of the diluted exhaust emissions is collected continuously for subsequent analysis, using a constant volume (variable dilution) sampler (Diesel dilute exhaust is continuously analyzed for hydrocarbons using a heated sample line and analyzer).

(c) The evaporative emission test (gasoline-fueled vehicles only) is designed to determine hydrocarbon evaporative emissions as a consequence of diurnal temperature fluctuation, urban driving, and hot soaks during parking. It is associated with a series of events representative of a motor vehicle's operation, which result in hydrocarbon vapor losses. The test procedure is designed to measure:

(1) Diurnal breathing losses resulting from daily temperature changes, measured by the enclosure technique;

(2) Running losses from suspected sources (if indicated by engineering analysis or vehicle inspection) resulting from a simulated trip on a chassis dynamometer, measured by carbon traps; and

(3) Hot soak losses which result when the vehicle is parked and the hot engine is turned off, measured by the enclosure technique.

(d) Except in cases of component malfunction or failure, all emission control systems installed on or incorporated in a new motor vehicle shall be functioning during all procedures in this subpart. Maintenance to correct component malfunction or failure shall be authorized in accordance with § 86.078–25.

§ 86.128–78 Transmissions.

(a) All test conditions, except as noted, shall be run according to the manufacturer's recommendation to the ultimate purchaser.

(b) Vehicles equipped with free wheeling or overdrive shall be tested with these features operated according to the manufacturer's recommendations to the ultimate purchaser.

(c) Idle modes shall be run with automatic transmission in "Drive" and the wheels braked; manual transmissions shall be in gear with the clutch disengaged, except first idle (see §§ 86.136 and 86.137).

(d) The vehicle shall be driven with minimum accelerator pedal movement to maintain the desired speed.

(e) Accelerations shall be driven smoothly according to the manufacturer's recommendation to the ultimate purchaser. For manual transmissions, the operator shall release the accelerator pedal during each shift and accomplish the shift with minimum time. If the vehicle cannot accelerate at the specified rate, the vehicle shall be operated with the accelerator pedal fully depressed until the vehicle speed reaches the value prescribed for that time in the driving schedule.

(f) The deceleration modes shall be run in gear using brakes or accelerator pedal as necessary to maintain the desired speed. Manual transmission vehicles shall have the clutch engaged and shall not change gears from the previous mode. For those modes which decelerate to zero, manual transmission clutches shall be depressed when the speed drops below 15 mph (24.14 km/h), when engine roughness is evident, or when engine stalling is imminent.

(g) Downshifting is allowed at the beginning of or during a power mode in accordance with the manufacturer's recommendation to the ultimate purchaser.

§ 86.129–78 Road load power and inertia weight determination.

(a) Flywheels, electrical or other means of simulating inertia as shown in the following table shall be used. If the equivalent inertia specified is not available on the dynamometer being used, the next higher equivalent inertia (not to exceed 250 lbs) available shall be used.

Loaded vehicle weight (pounds)	Equivalent inertia weight (pounds)	Road load power at 50 mph (horsepower)
Up to 1,125	1,000	5.9
1,126 to 1,375	1,250	6.5
1,376 to 1,625	1,500	7.1
1,626 to 1,875	1,750	7.7
1,876 to 2,125	2,000	8.3
2,126 to 2,375	2,250	8.8
2,376 to 2,625	2,500	9.4
2,626 to 2,875	2,750	9.9
2,876 to 3,250	3,000	10.5
3,251 to 3,750	3,500	11.2
3,751 to 4,250	4,000	12.0
4,251 to 4,750	4,500	12.7
4,751 to 5,250	5,000	13.4
5,251 to 5,750	5,500	13.9
5,751 to above	5,500	14.4

(b) *Power absorption unit adjustment.* (1) The power absorption unit shall be adjusted to reproduce road load power at 50 mph true speed. The indicated road load power setting shall take into account the dynamometer friction. The relationship between road load (absorbed) power and indicated road load power for a particular dynamometer shall be determined by the procedure outlined in § 86.118 or other suitable means.

(2) The road load power listed in the table above shall be used or the vehicle manufacturer may determine the road load power by an alternate procedure requested by the manufacturer and approved in advance by the Administrator, or the vehicle manufacturer may determine the road load power by the following procedure and request its use:

(i) *Gasoline-fueled vehicles.* (A) Measuring the absolute manifold pressure of a representative vehicle, of the same equivalent inertia weight class, when operated on a level road under balanced wind conditions at a true speed of 50 mph (80 km/h), and

(B) Noting the dynamometer indicated road load horsepower setting required to reproduce that manifold pressure when the same vehicle is operated on the dynamometer at a true speed of 50 mph. The tests on the road and on the dynamometer shall be performed with the same vehicle ambient absolute pressure (usually barometric), i.e., within ±5 mm Hg (±0.7 kPa).

(C) The road load power shall be determined according to the procedure outlined in § 86.118 and adjusted according to the following if applicable.

(ii) *Diesel vehicles.* (A) Measuring the fuel flow rate of a representative vehicle of the same equivalent inertia weight class, when operated on a level road under balanced wind conditions at a true speed of 50 mph, and

(B) Noting the dynamometer indicated road load horsepower setting required to reproduce that fuel flow rate when the same vehicle is operated on the dynamometer at a true speed of 50 mph (80 km/h). The tests on the road and on the dynamometer shall be performed with the same vehicle ambient absolute pressure (usually barometric), i.e., within ±5 mm Hg (±0.7 kPa).

(C) The road load power shall be determined according to the procedure outlined in § 86.118 and adjusted according to the following if applicable.

(3) Where it is expected that more than 33 percent of the vehicles in an engine family will be equipped with air conditioning, the road load power listed above or as determined in paragraph (b)(2) of this section shall be increased by 10 percent for testing all test vehicles representing such an engine family if those vehicles are intended to be offered with air conditioning in production.

§ 86.129–79 Road load power and inertia weight determination.

(a) Flywheels, electrical or other means of simulating inertia as shown in the following table shall be used. If the equivalent inertia specified is not available on the dynamometer being used, the next higher equivalent inertia (not to exceed 250 pounds) available shall be used.

Loaded vehicle weight (pounds)	Equivalent inertia weight (pounds)	Road load power at 50 mph (horsepower)	
		Light Duty Vehicles	Light Duty Trucks
Up to 1,125	1,000	5.9	
1,126 to 1,375	1,250	6.5	
1,376 to 1,625	1,500	7.1	
1,626 to 1,875	1,750	7.7	
1,876 to 2,125	2,000	8.3	
2,126 to 2,375	2,250	8.8	
2,376 to 2,625	2,500	9.4	
2,626 to 2,875	2,750	9.9	
2,875 to 3,250	3,000	10.3	
3,251 to 3,750	3,500	11.2	See notes (2) thru (4)
3,751 to 4,250	4,000	12.0	
4,251 to 4,750	4,500	12.7	
4,751 to 5,250	5,000	13.4	
5,251 to 5,750	5,500	13.9	
5,751 to 6,250	6,000(1)	14.4(1)	
6,251 to 6,750	6,500	-	
6,751 to 7,250	7,000	-	
7,251 to 7,750	7,500	-	
7,751 to 8,250	8,000	-	
8,251 to 8,750	8,500	-	
8,751 to 9,250	9,000	-	
9,251 to 9,750	9,500	-	
9,751 to 10,000	10,000	-	

Notes:

(1) Light duty vehicles over 5,750 pounds loaded vehicle weight shall be tested with a 5,500 pound equivalent inertia and a 14.4 horsepower road load.

(2) For all light duty trucks except vans, and for heavy duty vehicles optionally certified as light duty trucks, the road load power (horsepower) at 50 mph shall be 0.58 times A (defined below) rounded to the nearest one half horsepower.

(3) For vans, the road load power at 50 mph (horsepower) shall be 0.50 times A (defined below) rounded to the nearest one half horsepower.

(4) "A" is the basic vehicle frontal area (ft^2) plus the additional frontal area (ft^2) of mirrors and optional equipment exceeding 0.1 square feet which are anticipated to be sold on more than 33 percent of [illegible] car line. Frontal area measurements shall be computed to the nearest [illegible]th of a square foot.

(b) *Power absorption unit adjustment.* (1) The power absorption unit shall be adjusted to reproduce road load power at 50 mph true speed. The indicated road load power setting shall take into account the dynamometer friction. The relationship between road load (absorbed) power and indicated road load power for a particular dynamometer shall be determined by the procedure outlined in § 86.118 or other suitable means.

(2) The road load power listed in the table above shall be used or the vehicle manufacturer may determine the road load power by an alternate procedure requested by the manufacturer and approved in advance by the Administrator, or the vehicle manufacturer may determine the road load power by the following procedure and request its use:

(i) *Gasoline-fueled vehicles.* (A) Measuring the absolute manifold pressure of a representative vehicle, of the same equivalent inertia weight class, when operated on a level road under balanced wind conditions at a true speed of 50 mph (80 km/h), and

(B) Noting the dynamometer indicated road load horsepower setting required to reproduce that manifold pressure when the same vehicle is operated on the dynamometer at a true speed of 50 mph. The tests on the road and on the dynamometer shall be performed with the same vehicle ambient absolute pressure (usually barometric), i.e., within ±5 mm Hg (±0.7 kPa).

(C) The road load power shall be determined according to the procedure outlined in § 86.118 and adjusted according to the following if applicable.

(ii) *Diesel vehicles.* (A) Measuring the fuel flow rate of a representative vehicle of the same equivalent inertia weight class, when operated on a level road under balanced wind conditions at a true speed of 50 mph, and

(B) Noting the dynamometer indicated road load horsepower setting required to reproduce that fuel flow rate when the same vehicle is operated on the dynamometer at a true speed of 50 mph (80 km/h). The tests on the road and on the dynamometer shall be performed with the same vehicle ambient absolute pressure (usually barometric), i.e., within ±5 mm Hg (±0.7 kPa).

(C) The road load power shall be determined according to the procedure outlined in § 86.118 and adjusted according to the following if applicable.

(b)(3) Where it is expected that more than 33 percent of the vehicles in an engine family will be equipped with air conditioning, the road load power listed above or as determined in paragraph (b)(2) of this section shall be increased by 10 percent, up to a maximum increase of 1.4 horsepower, for testing all test vehicles representing such an engine family if those vehicles are intended to be offered with air conditioning in production. If the table in paragraph (b)(1) of this section is used to determine the road load power for light-duty trucks, the above increase for air conditioning shall be added prior to rounding off as instructed by notes 2 and 3 of the table.

§ 86.130–78 Test sequence; general requirements.

The test sequence shown in Figure B78–10 shows the steps encountered as the test vehicle undergoes the procedures subsequently described to determine conformity with the standards set forth. Ambient temperature levels encountered by the test vehicle throughout the test sequence shall not be less than 68° F (20° C) nor more than 86° F (30° C). The vehicle shall be approximately level during all phases of the test sequence to prevent abnormal fuel distribution.

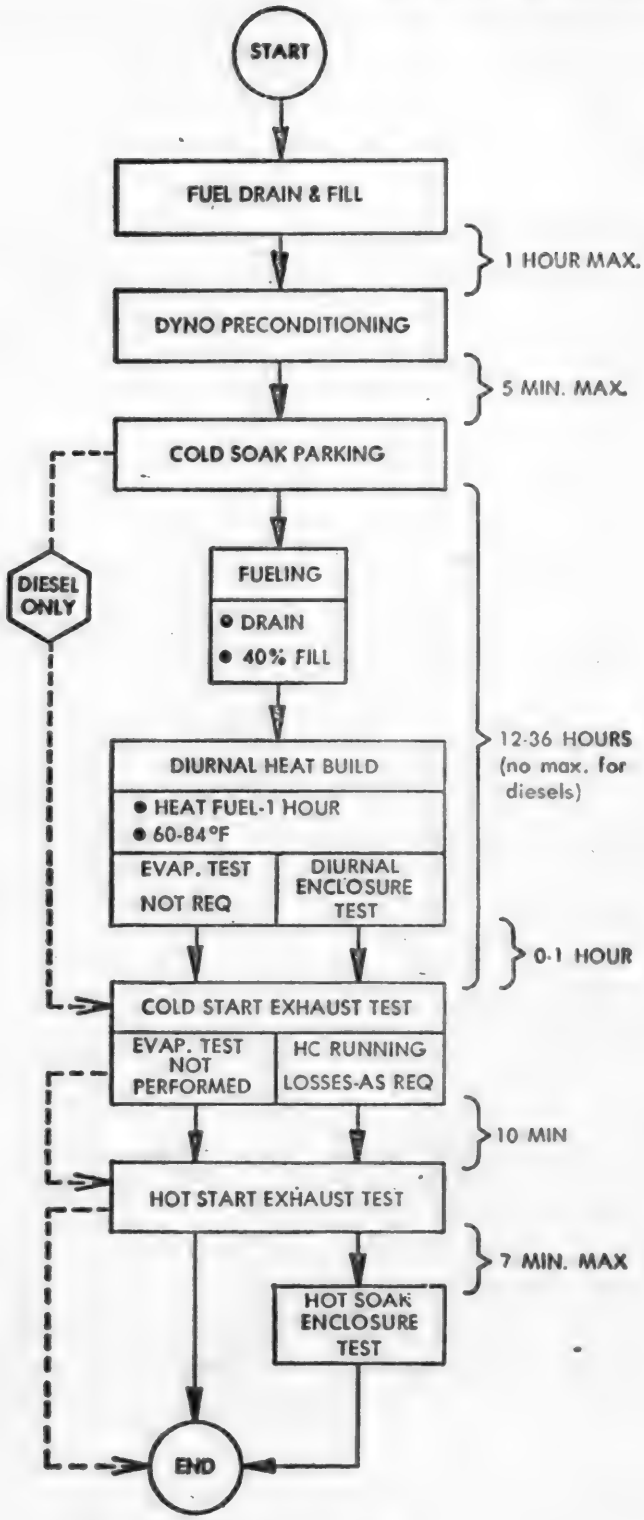


FIGURE B78-10 TEST SEQUENCE

§ 86.131–78 Vehicle preparation.

(a) For gasoline-fueled vehicles prepare the fuel tank(s) for recording the temperature of the prescribed test fuel at the approximate mid-volume of the fuel.

(b) Provide additional fittings and adapters, as required, to accommodate a fuel drain at the lowest point possible in the tank(s) as installed on the vehicle.

§ 86.132–78 Vehicle preconditioning.

(a) The vehicle shall be moved to the test area and the following operations performed:

(1) The fuel tank(s) shall be drained through the provided fuel tank(s) drain(s) and filled to the prescribed "tank fuel volume" with the specified test fuel, § 86.113. For the above operations the evaporative emission control system shall neither be abnormally purged nor abnormally loaded.

(2) Within one hour of being fueled the vehicle shall be placed, either by being driven or pushed, on a dynamometer and operated through one UDDS test procedure, see § 86.115 and Appendix I. A gasoline-fueled test vehicle may not be used to set dynamometer horsepower.

(3) For those unusual circumstances where additional preconditioning is desired by the manufacturer, such preconditioning may be allowed with the advance approval of the Administrator. The Administrator may also choose to conduct or require the conduct of additional preconditioning to insure that the evaporative emission control system is stabilized. The additional preconditioning shall consist of an initial one hour minimum soak and, one, two or three driving cycles of the UDDS, as described in paragraph (a)(2) of this section, each followed by a soak of at least one hour with engine off, engine compartment cover closed and cooling fan off. The vehicle may be driven off the dynamometer following each UDDS for the soak period.

(b) Within five minutes of completion of preconditioning the vehicle shall be driven off the dynamometer and parked. The vehicle shall be stored for not less than 12 hours nor for more than 36 hours (except Diesel vehicles which have no maximum time limitation) prior to the cold start exhaust test. (Gasoline-fueled vehicles undergo a one hour diurnal heat build prior to the cold start exhaust test. A wait of up to one hour is permitted between the end of the diurnal heat build and the beginning of the cold start exhaust test. See § 86.130 and Figure B78–10.)

(c) Vehicles to be tested for evaporative emissions shall be processed in accordance with procedures in §§ 86.133 through 86.138. Vehicles to be tested for exhaust emissions only shall be processed according to §§ 86.133 through 86.137.

§ 86.133–78 Diurnal breathing loss test.

(a)(1) Following vehicle preparation and vehicle preconditioning procedures described in §§ 86.131 and 86.132 the test

vehicle shall be allowed to soak for a period of not less than 12 or more than 36 hours prior to the exhaust emission test. The diurnal test shall start not less than 10 or more than 35 hours after the end of the preconditioning procedure. The start of the exhaust test shall follow the end of the diurnal test within one hour.

(2) Gasoline-fueled vehicles to be tested for exhaust emissions only shall undergo the diurnal heat build. Since no evaporative measurements are necessary, an evaporative enclosure is not required.

(b) The evaporative emission enclosure shall be purged for several minutes immediately prior to the test.

NOTE.—If at anytime the hydrocarbon concentration exceeds 15,000 ppm C the enclosure should be immediately purged. This concentration provides a 4:1 safety factor against the lean flammability limit.

(c) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the test.

(d) If not already on, the evaporative enclosure mixing fan shall be turned on at this time.

(e) Immediately prior to the diurnal breathing loss test, the fuel tank(s) of the prepared vehicle shall be drained and recharged with the specified test fuel, § 86.113, to the prescribed "tank fuel volume," defined in § 86.078–2. The temperature of the fuel prior to its delivery to the fuel tank shall be between 50 and 60° F (10 and 16° C). The fuel tank cap(s) is not installed until the diurnal heat build begins.

(f) The test vehicle, with the engine shut off, shall be moved into the evaporative emission enclosure, the test vehicle windows and luggage compartments shall be opened, the fuel tank temperature sensor shall be connected to the temperature recording system, and, if required, the heat source shall be properly positioned with respect to the fuel tank(s) and/or connected to the temperature controller.

(g) The temperature recording system shall be started.

(h) The fuel may be artificially heated to the starting diurnal temperature.

(i) When the fuel temperature recording system reaches at least 58° F (14° C), immediately:

(1) Install fuel tank cap(s).

(2) Turn off purge blowers, if not already off at this time.

(3) Close and seal enclosure doors.

(j) When the fuel temperature recording system reaches 60±2° F (16±1.1° C), immediately:

(1) Analyze enclosure atmosphere for hydrocarbons and record. This is the initial (time=0 minutes) hydrocarbon concentration, C_{HCI}, § 86.143.

(2) Start diurnal heat build and record time. This commences the 60±2 minute test period.

(k) The fuel shall be heated in such a way that its temperature change conforms to the following function to within ±3° F (±1.6° C):

$F = T_o + 0.4t$

for SI units, $C = T_o + (2/9)t$

Where:

F = fuel temperature, ° F
C = fuel temperature, ° C
t = time since beginning of test, minutes.
T_o = initial temperature.

After 60±2 minutes of heating, the fuel temperature rise shall be 24±1° F (−4° C (±0.5° C)).

(l) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the end of the diurnal test.

(m) The end of the diurnal breathing loss test occurs 60±2 minutes after the heat build begins, paragraph (j)(2). Analyze the enclosure atmosphere for hydrocarbons and record. This is the final (time=60 minutes) hydrocarbon concentration, C_{HCF}, § 86.143. The time (or elapsed time) of this analysis shall be recorded.

(n) The heat source shall be turned off and the enclosure doors unsealed and opened.

(o) The heat source shall be moved away from the vehicle, if required, and/or disconnected from the temperature controller, the fuel tank temperature sensor shall be disconnected from the temperature recording system, the test vehicle windows and luggage compartments may be closed and the test vehicle, with the engine shut off, shall be removed from the evaporative emission enclosure.

(p) For vehicles with multiple tanks, the largest tank shall be designated as the primary tank and shall be heated in accordance with the procedures described in paragraph (k) of this section. All other tanks shall be designated as auxiliary tanks and shall undergo a similar heat build such that the fuel temperature shall be within 3°F (1.6°C) of the primary tank.

§ 86.134–78 Running loss test.

(a) If an engineering analysis or vehicle inspection indicates the possibility of evaporative emissions during vehicle operation, evaporative emission running loss measurements shall be made during the cold transient and stabilized portion of the exhaust emission test. Since running loss measurements cannot be made in the enclosure, the equipment described in § 86.177–17 shall be used to collect these emissions.

(1) The procedure in § 86.135 shall be followed.

(2) Prior to the initiation of the cold start exhaust emission test, the vapor loss measurement system shall be connected to all suspected sources of running loss evaporative emissions.

(3) The cold start transient and stabilized exhaust emission test portions shall be conducted according to the procedures of § 86.135 through § 86.137.

(4) Within one minute after the end of the stabilized exhaust emission test, the vapor loss measurement system shall be disconnected from the vehicle and the inlets and outlets sealed.

(5) Within one hour from the end of the running loss measurement, weigh the vapor collection traps.

§ 86.135–78 Dynamometer procedure.

(a) The dynamometer run consists of two tests, a "cold" start test after a minimum 12-hour and a maximum 36-hour soak according to the provisions of §§ 86.132 and 86.133 and a "hot" start test following the "cold" start test by 10 minutes. Engine startup (with all accessories turned off), operation over the driving schedule, and engine shutdown make a complete cold start test. Engine startup and operation over the first 505 seconds of the driving schedule complete the hot start test. The exhaust emissions are diluted with ambient air and a continuously proportional sample is collected for analysis during each phase. The composite samples collected in bags are analyzed for hydrocarbons (except diesel hydrocarbons which are analyzed continuously), carbon monoxide, carbon dioxide, and oxides of nitrogen. A parallel sample of the dilution air is similarly analyzed for hydrocarbon, carbon monoxide, carbon dioxide, and oxides of nitrogen.

(b) During dynamometer operation, a fixed speed cooling fan shall be positioned so as to direct cooling air to the vehicle in an appropriate manner with the engine compartment cover open. In the case of vehicles with front engine compartments, the fan shall be squarely positioned within 12 inches of the vehicle. In the case of vehicles with rear engine compartments (or if special designs make the above impractical), the cooling fan shall be placed in a position to provide sufficient air to maintain vehicle cooling. The fan capacity shall normally not exceed 5,300 cfm (2.50 m^3/s). If, however, the manufacturer can show that during field operation the vehicle receives additional cooling, and that such additional cooling is needed to provide a representative test, the fan capacity may be increased or additional fans used if approved in advance by the Administrator.

(c) The vehicle speed as measured from the dynamometer rolls shall be used. A speed vs. time recording, as evidence of dynamometer test validity, shall be supplied on request of the Administrator.

(d) Practice runs over the prescribed driving schedule may be performed at test points, provided an emission sample is not taken, for the purpose of finding the minimum throttle action to maintain the proper speed-time relationship, or to permit sampling system adjustments.

NOTE.—When using two-roll dynamometers a truer speed-time trace may be obtained by minimizing the rocking of the vehicle in the rolls. The rocking of the vehicle changes the tire rolling radius on each roll. This rocking may be minimized by restraining the vehicle horizontally (or nearly so) by using a cable and winch.

(e) The drive wheel tires may be inflated up to a gauge pressure of 45 psi (310 kPa) in order to prevent tire damage. The drive wheel tire pressure shall be reported with the test results.

(f) If the dynamometer has not been operated during the 2-hour period im-

mediately preceding the test it shall be warmed up for 15 minutes by operating at 30 mph (48 km/h) using a non-test vehicle or as recommended by the dynamometer manufacturer.

(g) If the dynamometer horsepower must be adjusted manually, it shall be set within 1 hour prior to the exhaust emissions test phase. The test vehicle shall not be used to make the adjustment. Dynamometers using automatic control of preselectable power settings may be set anytime prior to the beginning of the emissions test.

(h) The driving distance as measured by counting the number of dynamometer roll or shaft resolutions, shall be determined for the transient cold start, stabilized cold start, and transient hot start phases of the test. The revolutions shall be measured on the same roll or shaft used for measuring the vehicle's speed.

§ 86.135–79 Dynamometer procedure.

(a) The dynamometer run consists of two tests, a "cold" start test after a minimum 12-hour and a maximum 36-hour soak according to the provisions of §§ 86.132 and 86.133 and a "hot" start test following the "cold" start test by 10 minutes. Engine startup (with all accessories turned off), operation over the driving schedule, and engine shutdown make a complete cold start test. Engine startup and operation over the first 505 seconds of the driving schedule complete the hot start test. The exhaust emissions are diluted with ambient air and a continuously proportional sample is collected for analysis during each phase. The composite samples collected in bags are analyzed for hydrocarbons (except diesel hydrocarbons which are analyzed continuously), carbon monoxide, carbon dioxide, and oxides of nitrogen. A parallel sample of the dilution air is similarly analyzed for hydrocarbon, carbon monoxide, carbon dioxide, and oxides of nitrogen.

(b) During dynamometer operation, a fixed speed cooling fan shall be positioned so as to direct cooling air to the vehicle in an appropriate manner with the engine compartment cover open. In the case of vehicles with front engine compartments, the fan shall be squarely positioned within 12 inches of the vehicle. In the case of vehicles with rear engine compartments (or if special designs make the above impractical), the cooling fan shall be placed in a position to provide sufficient air to maintain vehicle cooling. The fan capacity shall normally not exceed 5,300 cfm (2.50 m^3/s). If, however, the manufacturer can show that during field operation the vehicle receives additional cooling, and that such additional cooling is needed to provide a representative test, the fan capacity may be increased or additional fans used if approved in advance by the Administrator.

(c) The vehicle speed as measured from the dynamometer rolls shall be used. A speed vs. time recording, as evidence of dynamometer test validity, shall be supplied on request of the Administrator.

(d) Practice runs over the prescribed driving schedule may be performed at test points, provided an emission sample is not taken, for the purpose of finding the minimum throttle action to maintain the proper speed-time relationship, or to permit sampling system adjustments.

NOTE.—When using two-roll dynamometers a truer speed-time trace may be obtained by minimizing the rocking of the vehicle in the rolls. The rocking of the vehicle changes the tire rolling radius on each roll. This rocking may be minimized by restraining the vehicle horizontally (or nearly so) by using a cable and winch.

(e) The drive wheel tires may be inflated up to a gauge pressure of 45 psi (310 kPa) in order to prevent tire damage. The drive wheel tire pressure shall be reported with the test results.

(f) If the dynamometer has not been operated during the 2-hour period immediately preceding the test it shall be warmed up for 15 minutes by operating at 30 mph (48 km/h) using a non-test vehicle or as recommended by the dynamometer manufacturer.

(g) If the dynamometer horsepower must be adjusted manually, it shall be set within 1 hour prior to the exhaust emissions test phase. The test vehicle shall not be used to make the adjustment. Dynamometers using automatic control of preselectable power settings may be set anytime prior to the beginning of the emissions test.

(h) The driving distance as measured by counting the number of dynamometer roll or shaft resolutions, shall be determined for the transient cold start, stabilized cold start, and transient hot start phases of the test. The resolutions shall be measured on the same roll or shaft used for measuring the vehicle's speed.

(i) Four wheel drive vehicles will be tested in a two wheel drive mode of operation. Full time four wheel drive vehicles will have one set of drive wheels temporarily disengaged by the vehicle manufacturer. Four wheel drive vehicles which can be manually shifted to a two wheel drive mode will be tested in the normal on-highway two wheel drive mode of operation.

§ 86.136–78 Engine starting and restarting.

(a) *Gasoline-fueled vehicles.* This paragraph (a) applies to gasoline-fueled vehicles.

(1) The engine shall be started according to the manufacturer's recommended starting procedures in the owner's manual. The initial 20-second idle period shall begin when the engine starts.

(2) Choke operation: (i) Vehicles equipped with automatic chokes shall be operated according to the manufacturer's operating instructions in the owner's manual, including choke setting and "kick-down" from cold fast idle.

(ii) Vehicles equipped with manual chokes shall be operated according to the manufacturer's operating instructions in the owner's manual.

(3) The transmission shall be placed in gear 15 seconds after the engine is started. If necessary, braking may be employed to keep the drive wheels from turning.

(4) The operator may use the choke, accelerator pedal, etc. where necessary to keep the engine running.

(5) If the manufacturer's operating instructions in the owner's manual do not specify a warm engine starting procedure, the engine (automatic- and manual-choke engines) shall be started by depressing the accelerator pedal about half way and cranking the engine until it starts.

(b) *Diesel vehicles.* The engine shall be started according to the manufacturer's recommended starting procedures in the owner's manual. The initial 20-second idle period shall begin when the engine starts. The transmission shall be placed in gear 15 seconds after the engine is started. If necessary, braking may be employed to keep the drive wheels from turning.

(c) If the vehicle does not start after 10 seconds of cranking, cranking shall cease and the reason for failure to start shall be determined. The gas flow measuring device (or revolution counter) on the constant volume sampler (and the hydrocarbon integrator when testing Diesel vehicles, see § 85.135 Dynamometer Test Runs) shall be turned off and the sampler selector valves placed in the "standby" position during this diagnostic period. In addition, either the CVS should be turned off or the exhaust tube disconnected from the tailpipe during the diagnostic period. If failure to start is an operational error, the vehicle shall be rescheduled for testing from a cold start.

(1) If a failure to start occurs during the cold portion of the test and is caused by a vehicle malfunction, corrective action of less than 30 minutes duration may be taken (according to § 86.078–25), and the test continued. The sampling system shall be reactivated at the same time cranking begins. When the engine starts, the driving schedule timing sequence shall begin. If failure to start is caused by vehicle malfunction and the vehicle cannot be started, the test shall be voided, the vehicle removed from the dynamometer, and corrective action may be taken according to § 86.078–25. The reasons for the malfunction (if determined) and the corrective action taken shall be reported to the Administrator.

(2) If a failure to start occurs during the hot start portion of the test and is caused by vehicle malfunction, the vehicle must be started within one minute of key on. The sampling system shall be reactivated at the same time cranking begins. When the engine starts, the driving schedule timing sequence shall begin. If the vehicle cannot be started within one minute of key on, the test shall be voided, the vehicle removed from the dynamometer, corrective action taken, (according to § 86.078–25), and the vehicle rescheduled for testing. The reason for the malfunction (if determined) and the corrective action taken shall be reported to the Administrator.

(d) If the engine "false starts," the operator shall repeat the recommended starting procedure (such as resetting the choke, etc.).

(e) *Stalling:* (1) If the engine stalls during an idle period, the engine shall be restarted immediately and the test continued. If the engine cannot be started soon enough to allow the vehicle to follow the next acceleration as prescribed, the driving schedule indicator shall be stopped. When the vehicle restarts, the driving schedule indicator shall be reactivated.

(2) If the engine stalls during some operating mode other than idle, the driving schedule indicator shall be stopped, the vehicle shall then be restarted and accelerated to the speed required at that point in the driving schedule and the test continued. During acceleration to this point, shifting shall be performed in accordance with § 86.128.

(3) If the vehicle will not restart within one minute, the test shall be voided, the vehicle removed from the dynamometer, corrective action taken, and the vehicle rescheduled for test. The reason for the malfunction (if determined) and the corrective action taken shall be reported to the Administrator.

§ 86.137–78 Dynamometer test runs.

(a) The vehicle shall be allowed to stand with the engine turned off for a period of not less than 12 hours or more than 36 hours before the cold start exhaust emission test. The cold start exhaust test shall follow the diurnal breathing loss test by not more than one hour. The vehicle shall be stored prior to the emission test in such a manner that precipitation (e.g., rain or dew) does not occur on the vehicle. The complete dynamometer test consists of a cold start drive of 7.5 miles (12.1 km) and simulates a hot start drive of 7.5 miles (12.1 km). The vehicle is allowed to stand on the dynamometer during the 10-minute time period between the cold and hot start tests. The cold start test is divided into two periods. The first period, representing the cold start "transient" phase, terminates at the end of the deceleration which is scheduled to occur at 505 seconds of the driving schedule. The second period, representing the "stabilized" phase, consists of the remainder of the driving schedule including engine shutdown. The hot start test similarly consists of two periods. The period, representing the hot start "transient" phase, terminates at the same point in the driving schedule as the first period of the cold start test. The second period of the hot start test, "stabilized" phase, is assumed to be identical to the second period of the cold start test. Therefore, the hot start test terminates after the first period (505 seconds) is run.

(b) The following steps shall be taken for each test:

(1) Place drive wheels of vehicle on dynamometer without starting engine. Reset and engage the roll revolution counter.

(2) Open the vehicle engine compartment cover and position the cooling fan.

(3) With the sample selector valves in the "standby" position, connect evacuated sample collection bags to the dilute exhaust and dilution air sample collection systems.

(4) Start the CVS (if not already on), the sample pumps, the temperature recorder, the vehicle cooling fan and the heated hydrocarbon analysis recorder (Diesel only). (The heat exchanger of the constant volume sampler, if used, Diesel hydrocarbon analyzer continuous sample line and filter (if applicable) should be preheated to their respective operating temperatures before the test begins.)

(5) Adjust the sample flow rates to the desired flow rate (minimum of 10 cfh, 0.28 m^3/hr) and set the gas flow measuring devices to zero.

NOTE.—CFV-CVS sample flowrate is fixed by the venturi design.

(6) Attach the flexible exhaust tube to the vehicle tailpipe(s).

(7) Start the gas flow measuring device, position the sample selector valves to direct the sample flow into the "transient" exhaust sample bag and the "transient" dilution air sample bag (turn on the Diesel hydrocarbon analyzer system integrator and mark the recorder chart, if applicable), turn the key on, and start cranking the engine.

(8) Fifteen seconds after the engine starts, place the transmission in gear.

(9) Twenty seconds after the engine starts, begin the initial vehicle acceleration of the driving schedule.

(10) Operate the vehicle according to the dynamometer driving schedule (§ 86.115).

(11) At the end of the deceleration which is scheduled to occur at 505 seconds, simultaneously switch the sample flows from the "transient" bags to the "stabilized" bags, switch off gas flow measuring device No. 1 (and the Diesel hydrocarbon integrator No. 1, mark the Diesel hydrocarbon recorder chart) and start gas flow measuring device No. 2 (and Diesel hydrocarbon integrator No. 2). Before the acceleration which is scheduled to occur at 510 seconds, record the measured roll or shaft revolutions and reset the counter or switch to a second counter. As soon as possible transfer the "transient" exhaust and dilution air samples to the analytical system and process the samples according to § 86.140 obtaining a stabilized reading of the exhaust sample on all analyzers within 20 minutes of the end of the sample collection phase of the test.

(12) Turn the engine off 2 seconds after the end of the last deceleration (at 1,369 seconds).

(13) Five seconds after the engine stops running, simultaneously turn off gas flow measuring device No. 2 (and the Diesel hydrocarbon integrator No. 2, mark the hydrocarbon recorder chart, if applicable) and position the sample selector valves to the "standby" position. Record the measured roll or shaft revolutions and reset the counter. As soon as possible transfer the "stabilized" exhaust and dilution air samples to the analytical system and process the samples according to § 86.140 obtaining a stabilized reading of the exhaust sample on all analyzers within 20 minutes of the end of the sample collection phase of the test.

(14) Immediately after the end of the sample period turn off the cooling fan and close the engine compartment cover.

(15) Turn off the CVS or disconnect the exhaust tube from the tailpipe of the vehicle.

(16) Repeat the steps in paragraph (b) (2) through (10) of this section for the hot-start test, except only one evacuated sample bag is required for sampling exhaust gas and one for dilution air. The key-on operation step described in paragraph (b)(7) of this section shall begin between 9 and 11 minutes after the end of the sample period for the cold-start test.

(17) At the end of the deceleration which is scheduled to occur at 505 seconds, simultaneously turn off gas flow measuring device No. 1 (and Diesel hydrocarbon integrator No. 1, mark the Diesel hydrocarbon recorder chart, if applicable) and position the sample selector valve to the "standby" position. (Engine shutdown is not part of the hot start test sample period.) Record the measured roll or shaft revolutions.

(18) As soon as possible transfer the hot start "transient" exhaust and dilution air samples to the analytical system and process the samples according to § 86.140 obtaining a stabilized reading of the exhaust sample on all analyzers within 20 minutes of the end of the sample collection phase of the test.

(19) Disconnect the exhaust tube from the vehicle tailpipe(s) and drive vehicle from dynamometer.

(20) The CVS may be turned off, if desired.

(21) Vehicles to be tested for evaporative emissions will proceed according to § 86.138. For all others this completes the test sequence.

§ 86.138–78 Hot-soak test.

The hot-soak evaporative emission test shall be conducted immediately following the hot transient exhaust emission test.

(a) Prior to the completion of the hot-start transient exhaust emission sampling period, the evaporative emission enclosure shall be purged for several minutes.

(b) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the test.

(c) If not already on, the evaporative enclosure mixing fan shall be turned on at this time.

(d) Upon completion of the hot transient exhaust emission sampling period, the vehicle engine compartment cover shall be closed, the cooling fan shall be moved, the vehicle shall be disconnected from the dynamometer and exhaust sampling system, and then driven at minimum throttle to the vehicle entrance of the enclosure.

(e) The vehicle's engine must be stopped before any part of the vehicle enters the enclosure. The vehicle may be pushed or coasted into the enclosure.

(f) The test vehicle windows and luggage compartments shall be opened, if not already open.

(g) The temperature recording system shall be started and the time of engine

shut off shall be noted on the evaporative emission hydrocarbon data recording system.

(h) The enclosure doors shall be closed and sealed within two minutes of engine shutdown and within seven minutes after the end of the exhaust test.

(i) The 60±0.5 minute hot soak begins when the enclosure doors are sealed. The enclosure atmosphere shall be analyzed and recorded. This is the initial (time=0 minutes) hydrocarbon concentration, C_{HCi}, for use in calculating evaporative losses, see § 86.143.

(j) The test vehicle shall be permitted to soak for a period of one hour in the enclosure.

(k) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the end of the test.

(l) At the end of the 60±0.5 minute test period, again analyze the enclosure atmosphere and record time. This is the final (time=60 minutes) hydrocarbon concentration, C_{HCf}, for use in calculating evaporative losses, see § 86.143. This operation completes the evaporative emission measurement procedure.

§ 86.139–78 [Reserved]

§ 86.140–78 Exhaust sample analysis.

The following sequence of operations shall be performed in conjunction with each series of measurements:

(a) Zero the analyzers and obtain a stable zero reading. Recheck after tests.

(b) Introduce span gases and set instrument gains. In order to avoid corrections, span and calibrate at the same flow rates used to analyze the test sample. Span gases should have concentrations equal to 75 to 100 percent of full scale. If gain has shifted significantly on the analyzers, check the calibrations. Show actual concentrations on chart.

(c) Check zeros; repeat the procedure in paragraphs (a) and (b) of this section if required.

(d) Check flowrates and pressures.

(e) Measure HC, CO, CO_2 and NO_x concentrations of samples.

(f) For Diesel vehicles, continuously record (integrate electronically if desired) dilute hydrocarbon emission levels during test. Background samples are collected in sample bags and analyzed as above.

(g) Check zero and span points. If difference is greater than 2 percent of full scale, repeat the procedure in paragraphs (a) through (f) of this section.

§ 86.141–78 [Reserved]

§ 86.142–78 Records required.

The following information shall be recorded with respect to each test:

(a) Test number.

(b) System or device tested (brief description).

(c) Date and time of day for each part of the test schedule.

(d) Instrument operator.

(e) Driver or operator.

(f) Vehicle: ID number, Manufacturer, Model year, Standards, Engine family, Evaporative emissions family, Basic engine description (including displacement, number of cylinders, and catalyst usage), Fuel system (including number of carburetors, number of carburetor barrels, fuel injection type, and fuel tank(s) capacity and location), Engine code, Inertia weight class, Actual curb weight at zero miles, Actual road load at 50 mph, Transmission configuration, Axle ratio, Car line, Odometer reading, Idle rpm, and Drive wheel tire pressure, as applicable.

(g) Indicated road load power absorption at 50 mph (80 km/h) and dynamometer serial number. As an alternative to recording the dynamometer serial number, a reference to a vehicle test cell number may be used, with the advance approval of the Administrator, provided the test cell records show the pertinent information.

(h) All pertinent instrument information such as tuning—gain—serial number—detector number—range. As an alternative, a reference to a vehicle test cell number may be used, with the advance approval of the Administrator, provided test cell calibration records show the pertinent instrument information.

(i) Recorder charts: Identify zero, span, exhaust gas, and dilution air sample traces.

(j) Test cell barometric pressure, ambient temperature and humidity.

NOTE.—A central laboratory barometer may be used: *Provided*, That individual test cell barometric pressures are shown to be within ±0.1 percent of the barometric pressure at the central barometer location.

(k) Fuel temperatures, as prescribed.

(l) Pressure of the mixture of exhaust and dilution air entering the CVS metering device, the pressure increase across the device, and the temperature at the inlet. The temperature may be recorded continuously or digitally to determine temperature variations.

(m) The number of revolutions of the positive displacement pump accumulated during each test phase while exhaust samples are being collected. The number of standard cubic feet metered by a critical flow venturi during each test phase would be the equivalent record for a CFV-CVS.

(n) The humidity of the dilution air.

NOTE.—If conditioning columns are not used (see § 86.122 and § 86.144) this measurement can be deleted. If the conditioning columns are used and the dilution air is taken from the test cell, the ambient humidity can be used for this measurement.

(o) Temperature set point of the heated sample line and heated hydrocarbon detector temperature control system (for Diesel vehicles only).

(p) The driving distance for each of the three phases of the test, calculated from the measured roll of shaft revolutions.

§ 86.142–79 Records required.

The following information shall be recorded with respect to each test:

(a) Test number.

(b) System or device tested (brief description).

(c) Date and time of day for each part of the test schedule.

(d) Instrument operator.

(e) Driver or operator.

(f) Vehicle: ID number, Manufacturer, Model year, Standards, Engine family, Evaporative emissions family, Basic engine description (including displacement, number of cylinders, and catalyst usage), Fuel system (including number of carburetors, number of carburetor barrels, fuel injection type, and fuel tank(s) capacity and location), Engine code, Gross vehicle weight rating, Inertia weight class, Actual curb weight at zero miles, Actual road load at 50 mph, Transmission configuration, Axle ratio, Car line, Odometer reading, Idle rpm and Drive wheel tire pressure, as applicable.

(g) Indicated road load power absorption at 50 mph (80 km/h) and dynamometer serial number. As an alternative to recording the dynamometer serial number, a reference to a vehicle test cell number may be used, with the advance approval of the Administrator, provided the test cell records show the pertinent information.

(h) All pertinent instrument information such as tuning—gain—serial number—detector number—range. As an alternative, a reference to a vehicle test cell number may be used, with the advance approval of the Administrator, provided test cell calibration records show the pertinent instrument information.

(i) Recorder charts: Identify zero, span, exhaust gas, and dilution air sample traces.

(j) Test cell barometric pressure, ambient temperature and humidity.

NOTE.—A central laboratory barometer may be used: *Provided*, That individual test cell barometric pressures are shown to be within ±0.1 percent of the barometric pressure at the central barometer location.

(k) Fuel temperatures, as prescribed.

(l) Pressure of the mixture of exhaust and dilution air entering the CVS metering device, the pressure increase across the device, and the temperature at the inlet. The temperature may be recorded continuously or digitally to determine temperature variations.

(m) The number of revolutions of the positive displacement pump accumulated during each test phase while exhaust samples are being collected. The number of standard cubic feet metered by a critical flow venturi during each test phase would be the equivalent record for a CFV-CVS.

(n) The humidity of the dilution air.

NOTE.—If conditioning columns are not used (see § 86.122 and § 86.144) this measurement can be deleted. If the conditioning columns are used and the dilution air is taken from the test cell, the ambient humidity can be used for this measurement.

(o) Temperature set point of the heated sample line and heated hydrocarbon detector temperature control system (for Diesel vehicles only).

(p) The driving distance for each of the three phases of the test, calculated from the measured roll of shaft revolutions.

§ 86.143–78 Calculations; evaporative emissions.

The calculation of the net hydrocarbon mass change in the enclosure is used to determine the diurnal and hot soak mass emissions. The mass is calculated from initial and final hydrocarbon concentrations in ppm carbon, initial and final enclosure ambient temperatures, initial and final barometric pressures, and net enclosure volume using the following equation:

$$M_{HC} = kV_e \times 10^{-4}\left[\frac{C_{HCf}P_{Bf}}{T_f} - \frac{C_{HCi}P_{Bi}}{T_i}\right]$$

Where:

M_{HC} = hydrocarbon mass, g.
C_{HC} = hydrocarbon concentration as ppm carbon.
V_e = net enclosure volume, ft³ (m³) as determined by subtracting 50 ft³ (1.42 m³) (volume of vehicle with trunk and windows open) from the enclosure volume. A manufacturer may use the measured volume of the vehicle (instead of the nominal 50 ft³) with advance approval by the Administrator: *Provided*, The measured volume is determined and used for all vehicles tested by that manufacturer.
P_B = barometric pressure, in. Hg (kPa).
T = enclosure ambient temperature, R (K).
k = .208 (12+H/C)
for SI units, k = 1.2 (12+H/C).

Where:

H/C = Hydrogen-carbon ratio.
H/C = 2.33 for diurnal emissions.
H/C = 2.2 for hot soak emissions.
i = indicates initial reading.
f = indicates final reading.

The final reported results shall be computed by summing the individual evaporative emission results determined for the diurnal breathing-loss test, running-loss test, and the hot-soak test.

§ 86.144–78 Calculations; exhaust emissions.

The final reported test results shall be computed by use of the following formula:

(a) For light-duty vehicles and light-duty trucks:

$$Y_{wm} = 0.43\left((Y_{ct}+Y_s)/(D_{ct}+D_s)\right) + 0.57\left((Y_{ht}+Y_s)/(D_{ht}+D_s)\right)$$

Where:

Y_{wm} = Weighted mass emissions of each pollutant, i.e., HC, CO, NO_x or CO_2, in grams per vehicle mile;
Y_{ct} = Mass emissions as calculated from the "transient" phase of the cold start test, in grams per test phase.
Y_{ht} = Mass emissions as calculated from the "transient" phase of the hot start test, in grams per test phase.
Y_s = Mass emissions as calculated from the "stabilized" phase of the cold start test, in grams per test phase.
D_{ct} = The measured driving distance from the "transient" phase of the cold start test, in miles.
D_{ht} = The measured distance from the "transient" phase of the hot start test, in miles.
D_s = The measured driving distance from the "stabilized" phase of the cold start test, in miles.

(b) The mass of each pollutant for each phase of both the cold start test and the hot start test is determined from the following:

(1) Hydrocarbon mass:

$$HC_{mass} = V_{mix} \times Density_{HC} \times (HC_{conc}/1{,}000{,}000)$$

(2) Oxides of nitrogen mass:

$$NOx_{mass} = V_{mix} \times Density_{NO_2} \times K_H \times (NOx_{conc}/1{,}000{,}000)$$

(3) Carbon monoxide mass:

$$CO_{mass} = V_{mix} \times Density_{CO} \times (CO_{conc}/1{,}000{,}000)$$

(4) Carbon dioxide mass:

$$CO_{2mass} = V_{mix} \times Density_{CO_2} \times (CO_{2conc}/100)$$

(c) Meaning of symbols:

(1) HC_{mass} = Hydrocarbon emissions, in grams per test phase.
$Density_{HC}$ = Density of hydrocarbons is 16.33 g/ft³ (.5767 kg/m³), assuming an average carbon to hydrogen ratio of 1:1.85, at 68° F (20° C) and 760 mm Hg (101.3 kPa) pressure.
HC_{conc} = Hydrocarbon concentration of the dilute exhaust sample corrected for background, in ppm carbon equivalent, i.e., equivalent propane×3.

$HC_{conc} = HC_e - HC_d(1-1/DF)$

Where:

HC_e = Hydrocarbon concentration of the dilute exhaust sample or, for Diesel, average hydrocarbon concentration of the dilute exhaust sample as calculated from the integrated HC traces, in ppm carbon equivalent.
HC_d = Hydrocarbon concentration of the dilution air as measured, in ppm carbon equivalent.

(2) NOx_{mass} = Oxides of nitrogen emissions, in grams per test phase.
$Density_{NO_2}$ = Density of oxides of nitrogen is 54.16 g/ft³ (1.913 kg/m³), assuming they are in the form of nitrogen dioxide, at 68° F (20° C) and 760 mm Hg (101.3 kPa) pressure.
NOx_{conc} = Oxides of nitrogen concentration of the dilute exhaust sample corrected for background, in ppm.

$NOx_{conc} = NOx_e - NOx_d\,(1-1/DF)$

Where:

NOx_e = Oxides of nitrogen concentration of the dilute exhaust sample as measured, in ppm.
NOx_d = Oxides of nitrogen concentration of the dilute air as measured, in ppm.

(3) CO_{mass} = Carbon monoxide emissions, in grams per test phase.
$Density_{CO}$ = Density of carbon monoxide is 32.97 g/ft³ (1.164 kg/m³), at 68° F (20°C) and 760 mm Hg (101.3 kPa) pressure.
CO_{conc} = Carbon monoxide concentration of the dilute exhaust sample corrected for background, water vapor, and CO_2 extraction, in ppm.

$CO_{conc} = CO_e - CO_d\,(1-1/DF)$

Where:

CO_e = Carbon monoxide concentration of the dilute exhaust sample volume corrected for water vapor and carbon dioxide extraction, in ppm. The calculation assumes the carbon to hydrogen ratio of the fuel is 1:1.85.

$CO_e = (1-0.01925\,CO_{2e} - 0.000323\,R)\,CO_m$

Where:

CO_m = Carbon monoxide concentration of the dilute exhaust sample as measured, in ppm.
CO_{2e} = Carbon dioxide concentration of the dilute exhaust sample, in percent.
R = Relative humidity of the dilution air, in percent (see § 86.142(n)).
CO_d = Carbon monoxide concentration of the dilution air corrected for water vapor extraction, in ppm.

$CO_d = (1-0.000323\,R)\,CO_{dm}$

Where:

CO_{dm} = Carbon monoxide concentration of the dilution air sample as measured, in ppm.

NOTE.—If a CO instrument which meets the criteria specified in § 86.111 is used and the conditioning column has been deleted, CO_m can be substituted directly for CO_e and CO_{dm} can be substituted directly for CO_d.

(4) CO_{2mass} = Carbon dioxide emissions, in grams per test phase.
$Density_{CO_2}$ = Density of carbon dioxide is 51.85 g/ft³ (1.848 kg/m³), at 68° F (20° C) and 760 mm Hg (101.3 kPa) pressure.
CO_{2conc} = Carbon dioxide concentration of the dilute exhaust sample corrected for background, in percent.

$CO_{2conc} = CO_{2e} - CO_{2d}\,(1-1/DF)$

Where:

CO_{2d} = Carbon dioxide concentration of the dilution air as measured, in percent.

(5) $DF = 13.4/[CO_{2e} + (HC_e + CO_e)\,10^{-4}]$
K_H = Humidity correction factor.
$K_H = 1/[1-0.0047(H-75)]$
for SI units $= 1/[1-0.0329(H-10.71)]$

Where:

H = Absolute humidity in grains (grams) of water per pound (kilogram) of dry air.

$H = [(43.478)R_a \times P_d]/[P_B - (P_d \times R_a/100)]$

for SI units, $H = [(6.211)R_a \times P_d]/[P_B - (P_d \times R_a/100)]$

R_a = Relative humidity of the ambient air, in percent.
P_d = Saturated vapor pressure, in mm Hg (kPa) at the ambient dry bulb temperature.
P_B = Barometric pressure, in mm Hg (kPa).
V_{mix} = Total dilute exhaust volume in cubic feet per test phase corrected to standard conditions (528 R) (293 K) and 760 mm Hg (101.3 kPa)).
For PDP–CVS, V_{mix} is:

$$V_{mix} = V_e \times \frac{N(P_B - P_d)\ 528\ R}{(760\ \text{mm Hg})\ (T_p)}$$

for SI units,

$$V_{mix} = V_e \times \frac{N(P_B - P_d)\ (293.15\ K)}{(101.325\ \text{kPa})\ (T_p)}$$

Where:

V_e = Volume of gas pumped by the positive displacement pump, in cubic feet (m³) per revolution. This volume is dependent on the pressure differential across the positive displacement pump.
N = Number of revolutions of the positive displacement pump during the test phase while samples are being collected.
P_B = Barometric pressure, in mm Hg (kPa).
P_d = Pressure depression below atmospheric measured at the inlet to the positive displacement pump, in mm Hg (kPa) (during an idle mode).
T_p = Average temperature of dilute exhaust entering positive displacement pump during test, R(K).

(d) Example calculation of mass values of exhaust emissions using positive displacement pump:

(1) For the "transient" phase of the cold start test assume the following: V_e = 0.39944 ft³/revolution; N = 10,468; R = 48.0 percent; R_a = 43.2 percent; P_B = 762 mm Hg; P_d = 22.225 mm Hg; P_p = 70 mm Hg; T_p = 570 R; HC_e = 306.8 ppm, carbon equivalent; NO_{xe} = 11.2 ppm; CO_m = 306.6 ppm; CO_{2e} = 1.43 per-

cent; HC_d=12.1 ppm; NO_{xd}=0.8 ppm; CO_{dm}=15.3 ppm.

CO_{2d}=0.032 percent; D_{ct}=3.598 miles.

Then:

V_{mix}=(0.29344) (10,485) (762–70) (528)/(760) (570)=2595.0 ft³ per test phase.

H=(43.478) (48.2) (22.225)/[762 — (22.225 × 48.2/100)] = 62 grains of water per pound of dry air

K_H=1/[1—0.0047(62—75)]=0.9424

CO_c=[1—0.01925 (1.43)—0.000323 (48)] 306.0=293.4 ppm

CO_d=[1—0.000323 (48)] 15.3=15.1 ppm

DF=13.4/[1.43+(105.8+293.4) ×10⁻⁴]=9.116

HC_{conc}=105.8—12.1(1—1/9.116)=95.03 ppm.

HC_{mass}=(2595) (16.33) (95.03/1,000,000) =4.027 grams per test phase.

NO_{Xconc}=11.2—0.8 (1—1/9.116)=10.49 ppm

NO_{Xmass}=(2595) (54.16) (10.49/1,000,000) (0.9424)=1.389 grams per test phase.

CO_{conc}=293.4—15.1 (1—1/9.116)=280.0 ppm

CO_{mass}=(2595) (32.97) (280/1,000,000)= 23.96 grams per test phase.

CO_{2conc}=1.43—.032 (1—1/9.116)=1.402%

CO_{2mass}=(2595.0) (51.85) (1.402/100) =1886 grams per test phase.

(2) For the stabilized portion of the cold start test assume that similar calculations resulted in the following:

HC_{mass}=0.62 grams per test phase

NO_{Xmass}=1.27 grams per test phase

CO_{mass}=5.98 grams per test phase

CO_{2mass}=2346 grams per test phase.

D_s=3.902 miles.

(3) For the "transient" portion of the hot start test assume that similar calculations resulted in the following:

HC_{mass}=0.51 grams per test phase

NO_{Xmass}=1.38 grams per test phase

CO_{mass}=5.01 grams per test phase

CO_{2mass}=1758 grams per test phase.

D_{bt}=3.598 miles.

(4) Weighted mass emission results:

HC_{wm}=0.43 [4.027+0.62)/(3.598+3.902)]+0.57 [(0.51 +0.62)/(3.598+3.902)]=0.352 grams per vehicle mile.

NO_{Xwm}=0.43 [(1.389+1.27)/(3.598+3.902)]+0.57 [(1.38 +1.27)/(3.598+3.902)]=.354 grams per vehicle mile.

CO_{wm}=0.43 [(23.96+5.98)/(3.598+3.902)]+0.57 [(5.01 +5.98)/(3.598+3.902)]=2.55 grams per vehicle mile.

CO_{2wm}=0.43 [(1886+2346)/(3.598+3.902)]+0.57 [(1758 +2346)/(3.598+3.902)]=555 grams per vehicle mile.

§ 86.145–78 [Reserved]

§§ 86.177–1—86.177–3 [Reserved]

§ 86.177–4 Section numbering; construction.

(a) The section numbering procedure specified in § 86.077–4(a) applies to §§ 86.177–5—86.177–23.

(b) Unless indicated otherwise, all provisions in this subpart apply to both gasoline-fueled and Diesel vehicles.

§ 86.177–5 Test procedures.

The procedures described in this and subsequent sections will be the test program to determine the conformity of vehicles with the standards set forth in §§ 86.077–8 and 86.077–9.

(a) Vehicles which are required to be tested for compliance with the exhaust and fuel evaporative emission standards of this subpart shall be tested according to the following procedures:

(1) The test consists of prescribed sequences of fueling, parking, and operating conditions. The exhaust gases generated during vehicle operation are diluted with air and sampled continuously for subsequent analysis of specific components by prescribed analytical techniques. The fuel evaporative emissions are collected for subsequent weighing during both vehicle parking and operating events. The test applies to vehicles equipped with catalytic or direct-flame afterburners, induction system modifications, or other systems or to uncontrolled vehicles and engines.

(2) The exhaust emission test is designed to determine hydrocarbon, carbon monoxide, and oxides of nitrogen mass emissions while simulating an average trip in an urban area of 7.5 miles. The test consists of engine startups and vehicle operation on a chassis dynamometer through a specified driving schedule, as described in Appendix I to this part. A proportional part of the diluted exhaust emissions is collected continuously for subsequent analysis using a constant volume (variable dilution) sampler.

(3) The fuel evaporative emission test is designed to determine fuel hydrocarbon evaporative emissions to the atmosphere as a consequence of urban driving and diurnal temperature fluctuations during parking. It is associated with a series of events representative of a motor vehicle's operation which result in fuel vapor losses directly from the fuel tank and carburetor. Activated carbon traps are employed in collecting the vaporized fuel. The test procedure is specifically aimed at collecting and weighing:

(i) Diurnal breathing losses from the fuel tank and other parts of the fuel system when the fuel tank is subjected to a temperature increase representative of the diurnal range;

(ii) Running losses from the fuel tank and carburetor resulting from a simulated trip on a chassis dynamometer; and

(iii) Hot soak losses from the fuel tank and carburetor which result when the vehicle is parked and the hot engine is turned off.

(4) Except in cases of component malfunction or failure, all emission control systems installed on or incorporated in a new motor vehicle shall be functioning during all procedures in this subpart. Maintenence to correct component malfunction or failure shall be authorized in accordance with § 86.077–25.

(b) Vehicles which are required to be tested for compliance only with the exhaust emission standards of this subpart shall be tested according to the following procedures:

(1) Gasoline-fueled vehicles (i) The test consists of prescribed sequences of fueling, parking, and operating conditions. The exhaust gases generated during vehicle operation are diluted with air and sampled continuously for subsequent analysis of specific components by prescribed analytical techniques. The test applies to vehicles equipped with catalytic or direct-flame afterburners, induction system modifications, or other systems or to uncontrolled vehicles and engines.

(ii) The exhaust emission test is designed to determine hydrocarbon, carbon monoxide, and oxides of nitrogen mass emissions while simulating an average trip in an urban area of 7.5 miles. The test consists of engine startups and vehicle operation on a chassis dynamometer through a specified driving schedule, as described in Appendix I to this part. A proportional part of the diluted exhaust emissions is collected continuously, for subsequent analysis, using a constant volume (variable dilution) sampler.

(iii) Except in cases of component malfunction or failure, all emission control systems installed on or incorporated in a new motor vehicle shall be functioning during all procedures in this subpart. Maintenance to correct component malfunction or failure shall be authorized in accordance with § 86.077–25.

(2) Diesel vehicles. (i) The test consists of prescribed sequences of fueling, parking, and operating conditions. The exhaust gases generated during vehicle operation are diluted with air and sampled continuously for analysis of Diesel exhaust hydrocarbon and subsequent analysis of other specific components by prescribed techniques. The test applies to vehicles equipped with catalytic or direct flame after-burners, other control systems or to uncontrolled vehicles and engines. All test phases are conducted with an amblient temperature range between 68° and 86° F.

(ii) The exhaust emission test is designed to determine hydrocarbon, carbon monoxide, and oxides of nitrogen mass emissions while simulating an average trip in an urban area of 7.5 miles. The test consists of engine startups and vehicle operation on a chassis dynamometer through a specified driving schedule, as described in Appendix I to this part. Using a constant volume (variable dilution) sampler, a proportional part of the diluted exhaust gas is analyzed continuously for hydrocarbons and an additional proportional part of the diluted exhaust gas is collected in a bag for subsequent analysis of the other components.

(iii) Except for component malfunction or failure, all emission control systems installed on or incorporated in a new motor vehicle shall be functioning during all procedures in this subpart. Component malfunction or failure shall be repaired in accordance with § 86.077–25.

§ 86.177–6 Fuel specifications.

(a) Gasoline. (1) Gasoline having the following specifications will be used by the Administrator in exhaust and evaporative emission testing. Gasoline having the following specifications or substantially equivalent specifications approved by the Administrator, shall be used by the manufacturer in exhaust and evaporative testing, except that the lead and octane specifications do not apply.

Item designation	ASTM	Leaded	Unleaded
Octane, research, minimum	D 2699	100	98
Pb. (organic), grams/U.S. gallon		1.4 min.	0.00–0.05
Distillation range:			
IBP,[1] °F	D 86	75–95	75–95
10 percent point, °F	D 86	120–135	120–135
50 percent point, °F	D 86	200–230	200–230
90 percent point, °F	D 86	300–325	300–325
EP, °F (maximum)	D 86	415	415
Sulfur, weight percent, maximum	D 1266	0.10	.10
Phosphorus, grams/U.S. gallon, maximum		.01	.005
RVP,[2][3] pounds	D 323	8.7–9.2	8.7–9.2
Hydrocarbon composition:			
Olefins, percent, maximum	D 1319	10	
Aromatics, percent, maximum	D 1319	35	35
Saturates	D 1319	Remainder	Remainder

[1] For testing at altitudes above 1,219 meters (4,000 feet) the specified range is 75–105.
[2] For testing which is unrelated to fuel evaporative emission control, the specified range is 8–9.2.
[3] For testing at altitudes above 1,219 meters (4,000 feet) the specified range is 7.9–9.2.

(2) Gasoline representative of commercial gasoline which will be generally available through retail outlets shall be used in mileage accumulation. For leaded gasoline, the minimum lead content shall be 1.4 grams per U.S. gallon, except that where the Administrator determines that vehicles represented by a test vehicle will be operated using gasoline of different lead content than that prescribed in this paragraph, he may consent in writing to use of a gasoline with a different lead content. The octane rating of the gasoline used shall be no higher than 4.0 research octane numbers above the minimum recommended by the manufacturer. The Reid Vapor Pressure of the gasoline used shall be characteristic of the motor fuel during the season in which the mileage accumulation takes place.

(3) The specification range of the gasoline to be used under paragraph (a)(2) of this section shall be reported in accordance with § 86.077–21(b)(3).

(b) Diesel fuels. (1) The Diesel fuels employed for testing shall be clean and bright, with pour and cloud points adequate for operability. The fuels may contain nonmetallic additives as follows: Cetane improver, metal deactivator, anti-oxidant, dehazer, antirust, pour depressant, dye, and dispersant.

(2) Diesel fuel meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in exhaust emissions testing. The grade of fuel recommended by the engine manufacturer, commercially designated as "Type 1–D" or "Type 2–D," shall be used.

Item	ASTM test method No.	Type 1–D	Type 2–D
Cetane	D 613	45–54	48–50
Distillation range	D 86		
IBP, °F		350–390	340–400
10-pct point, °F		370–430	400–490
50-pct point, °F		410–480	470–540
90-pct point, °F		480–520	520–610
EP, °F		520–580	580–660
Gravity, °API	D 287	40–44	33–37
Total sulfur, percent	D 129 or D 2622	0.05–0.20	0.3–0.5
Hydrocarbon composition	D 1319		
Aromatics, percent		8–15	[1] 27
Paraffins, naphthenes, olefins		(2)	(2)
Flashpoint, °F. (minimum)	D 93	120	130
Viscosity, centistokes	D 445	1.8–2.0	2.0–3.2

[1] Minimum.
[2] Remainder.

(3) Diesel fuel meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in service accumulation. The grade of fuel recommended by the engine manufacturer, commercially designated as "Type 1–D" or "Type 2–D," shall be used.

Item	ASTM test method No.	Type 1–D	Type 2–D
Cetane	D 613	45–54	45–55
Distillation range	D 86		
IBP, °F		350–390	350–410
10-pct point, °F		370–430	400–470
50-pct point, °F		410–480	470–540
90-pct point, °F		480–520	520–610
EP, °F		520–580	580–660
Gravity, °API	D 287	40–44	33–40
Total sulfur, percent	D 129 or D 2622	0.05–0.20	0.2–0.5
Flashpoint, °F (minimum)	D 93	120	130
Viscosity, centistokes	D 445	1.8–2.0	2.0–3.2

(4) Other petroleum distillate fuel specification requirements:

(i) Other petroleum distillate fuels may be used for testing and service accumulation provided they are commercially available, and

(ii) Information, acceptable to the Administrator, is provided to show that only the designated fuel would be used in customer service, and

(iii) Use of a fuel listed under paragraphs (b)(2) and (b)(3) of this section would have a detrimental effect on emissions or durability, and

(iv) Written approval from the Administrator of the fuel specifications was provided prior to the start of testing.

(5) The specification range of the fuels to be used under paragraphs (b)(2), (b)(3), and (b)(4) of this section shall be reported in accordance with § 86.077–21(b)(3).

§ 86.177–7 Gasoline-fueled vehicle and engine preparation.

(a) Gasoline-fueled vehicles to be tested for compliance with the exhaust and fuel evaporative emissions standards of this subpart shall be prepared as follows:

(1)(i) Apply appropriate leak proof fittings to all fuel system external vents to permit collection of effluent vapors from these vents during the course of the prescribed tests. Since the prescribed test requires the temporary plugging of the inlet pipe to the air cleaner, it will be necessary to install a probe for collecting the normal effluents from this source. Where antisurge/vent filler caps are employed on the fuel tank, plug off the normal vent if it does not conveniently lend itself to the collection of vapors which emanate from it, and introduce a separate vent, with appropriate fitting on the cap. Where the fuel tank vent line terminus is inaccessible, sever the line at a convenient point near the fuel tank and install the collection system in a closed circuit assembly with the severed ends. All fittings shall terminate in 5/16-inch ID tube sections for ready connection to the collection systems and shall be designed for minimum dead space.

(ii) The design and installation of the necessary fittings shall not disturb the normal function of the fuel system components or the normal pressure relationships in the system.

(2)(i) Inspect the fuel system carefully to insure the absence of any leaks to the atmosphere of either liquid or vapor which might affect the accuracy of the test or the performance of the control system. Corrective action, if required, shall be performed in accordance with § 86.077–25 and be reported with the test results under § 86.077–23.

(ii) Care should be exercised in the application of any pressure tests, neither to purge nor load the evaporative emission control system.

(3) Prepare fuel tank for recording the temperature of the prescribed test fuel at its approximate midvolume.

(4) Provide additional fittings and adapters as required, to accommodate a fuel drain at the lowest point possible in the tank as installed on the vehicle.

(b) Gasoline-fueled vehicles to be tested for compliance only with the exhaust emission standards of this subpart shall be prepared as follows:

(1)(i) Inspect the fuel system carefully to insure the absence of any leaks to the atmosphere of either liquid or vapor which might affect the accuracy of the test or the performance of the control system. Such inspection shall include the application of a pressure of 14.5 inches

of water (plus or minus 0.5 inches of water) to the fuel system. The pressure should be applied and allowed to stabilize and the fuel system isolated from the pressure source. The fuel system may not lose more than 2.0 inches of water for five minutes beginning with the isolation of the fuel system. Corrective action, if required, shall be performed in accordance with § 86.077–25 and be reported with the test results under § 86.077–23.

(ii) Care should be exercised, in the application of any pressure tests, neither to purge nor load the evaporative emission control system.

§ 86.177–8 Vehicle preconditioning.

(a) Gasoline-fueled vehicles to be tested for compliance with the exhaust and fuel evaporative emissions standard of this part shall be preconditioned as follows:

(1) The test vehicle shall be operated under the conditions prescribed for mileage accumulation, § 86.077–26, for one hour immediately prior to the operation prescribed below.

(2) The fuel tank shall be drained and specified test fuel (§ 86.177–6(a)) added. The evaporative emission control system or device shall not be abnormally purged or loaded as a result of draining or fueling the tank.

(3) The test vehicle shall be placed on the dynamometer and operated over a simulated trip, according to the applicable requirements and procedures of §§ 86.177–10 through 86.177–15 except that the engine need not be cold when starting the run on the dynamometer and only a single trip of 7.5 miles shall be run. The test vehicle may be used to set dynamometer horsepower, if necessary. During this operation the ambient temperature shall be between 68° F and 86° F.

(4) The engine and cooling fan shall be stopped upon completion of the dynamometer operation and the vehicle permitted to soak either on or off the dynamometer stand at an ambient temperature between 68° F and 86° F for a period of not less than one hour prior to the soak period prescribed in § 86.177–9(a)(1).

(b) Gasoline-fueled vehicles to be tested for compliance only with the exhaust emissions standards of this part shall be preconditioned as follows:

(1) The fuel tank(s) shall be drained and filled with the specified test fuel (§ 86.177–6(a)) to the prescribed tank(s) fuel volume, defined in § 86.077–2. The fuel added to the vehicle tank(s) shall have an initial temperature of no more than 86°F. The evaporative emission control system or device shall not be abnormally purged or loaded as a result of draining or fueling the tank(s).

(2) The test vehicle shall be placed on the dynamometer and operated over a simulated trip, according to the applicable requirements and procedures of §§ 86.177–10 through 86.177–15 except that the engine need not be cold when starting the run on the dynamometer and only a single trip of 7.5 miles shall be run. Longer preconditioning may be permitted with advance approval of the Administrator. The test vehicle may be used to set dynamometer horsepower, if necessary. During this operation the ambient temperature shall be between 68°F and 86°F.

(3) The engine and cooling fan shall be stopped upon completion of the dynamometer operation and the vehicle permitted to soak either on or off the dynamometer stand at an ambient temperature between 68° F and 86° F for a period of not less than one hour.

(4) The test vehicle shall be allowed to soak in an area where the ambient temperature is maintained between 60°F and 86°F for a period of not less than 11 (eleven) hours prior to the dynamometer operation prescribed in §§ 86.177–10 through 86.177–20.

(5) The vehicle shall be operated on the dynamometer according to the requirements and procedures of § 86.177–20. This operation completes the test.

(c) Diesel vehicles to be tested for compliance with the exhaust emission standards of this part shall be preconditioned as follows:

(1) The fuel tank of the test vehicle shall be drained and charged with the specified test fuel, § 86.177–6(b)(2) to the prescribed "tank fuel volume," defined in § 86.077–2. The vehicle manufacturer shall provide additional fittings and adapters, as required to accommodate a fuel drain at the lowest point possible in the tank as installed on the vehicle. Test fuel, when charged to the tank shall be at ambient temperature, § 86.177–5(b)(2)(i).

(2) The test vehicle shall be placed on the dynamometer and operated over a simulated trip, according to the applicable requirements and procedures of §§ 86.177–10 through 86.177–15 except that the engine need not be cold when starting the run on the dynamometer and only a single trip of 7.5 miles shall be run. The test vehicle may be used to set dynamometer horsepower, if necessary.

(3) The engine and cooling fan shall be stopped upon completion of the dynamometer operation and the vehicle permitted to soak either on or off the dynamometer stand for a period of not less than 12 hours prior to the dynamometer test.

§ 86.177–9 Evaporative emission collection procedure for gasoline-fueled vehicles.

The standard test procedure consists of three parts described below which shall be performed in sequence and without any interruption in the test conditions prescribed.

(a) Diurnal breathing loss test. (1) The test vehicle shall be allowed to soak in an area where the ambient temperature is maintained between 60°F and 86°F, for a period of not less than 10 hours. (The vehicle preparation requirements of § 86.177–7 may be performed during this period.) It shall then be transferred to a soak area where the ambient temperature is maintained between 68°F and 86°F. Upon admittance to the 68°F–86°F soak area, the prescribed fuel tank thermocouple shall be connected to the recorder and the fuel and ambient temperature recorded at a chart speed of approximately 12 inches per hour (or equivalent record).

(2) The fuel tank of the prepared test vehicle, preconditioned according to § 86.177–8, shall be drained and recharged with the specified test fuel, § 86.177–6, to the prescribed "tank fuel volume," defined in § 86.077–2. The temperature of the fuel following the charge to the tank shall be 60°F±2°F. Care should be exercised against abnormal loading of the evaporative-emission control system or device as a result of fueling the tank.

(3) Immediately following the fuel charge to the tank, the exhaust pipe(s) and inlet pipe to the air cleaner shall be plugged and the prescribed vapor collection systems installed on all fuel system external vents. Multiple vents may be connected to a single collection trap provided that, where there is more than one external vent on a fuel system distinguishing between carburetor and tank vapors, separate collection systems shall be employed to trap the vapors from the separate sources. Every precaution shall be taken to minimize the lengths of the collection tubing employed and to avoid sharp bends across the entire system.

(4) Artificial means shall be employed to heat the fuel in the tank to 84°F±2°F. The prescribed temperature of the fuel shall be achieved over a period of 60 minutes ±10 minutes at a constant rate of change of temperature with respect to time. After a minimum of 1 hour following admittance to the 68°F–86°F soak area, the vehicle shall be moved onto the dynamometer stand for the subsequent part of the test. The fuel tank thermocouple may be temporarily disconnected to permit moving the test vehicle. Plugs shall be removed from the exhaust pipe(s) and inlet pipe to the air cleaner.

(b) Running loss test. (1) The vehicle shall be placed on the dynamometer.

(2) Where an external vent is located such that any running loss emissions would be inducted into the engine, the vapor loss measurement system shall be temporarily disconnected from that vent and clamped. Vapor losses from this vent need not be measured during this part of the test.

(3) The vehicle shall be operated on the dynamometer according to the requirements and procedures of §§ 86.177–10 through 86.177–20. The engine and fan shall be turned off upon completion of the dynamometer run and the exhaust and air cleaner inlet pipes shall be replugged.

(4) Vapor losses need not be measured during the 10-minute soak or 505-second hot start test. Any vapor loss collection system used during the cold start shall be temporarily disconnected and clamped. At the end of the hot start test, the vapor collection systems shall be reconnected for the following phase.

(c) Hot soak test. Upon completion of the dynamometer run, the test vehicle shall be permitted to soak with hood down for a period of one hour at an ambient temperature between 68°F and 86°F. This operation completes the test. The

traps are disconnected and weighed according to § 86.177–17.

(d) Alternate to paragraph (a) of this section: Diurnal breathing loss test. (1) The test vehicle shall be allowed to soak in an area where the ambient temperature is maintained between 60°F and 86°F for a period of not less than 10 hours. (The vehicle preparation requirements of § 86.177–7 may be performed during this period.) It shall then be transferred to a soak area where the ambient temperature is maintained between 68°F and 86°F.

(2) The fuel tank of the prepared test vehicle, preconditioned according to § 86.177–8, shall be drained and recharged with the specified test fuel, § 86.177–6, to the prescribed "tank fuel volume," defined in § 86.077–2. The temperature of the fuel prior to delivery to the fuel tank shall be between 50°F and 60°F. Care should be exercised against abnormal loading of the evaporative-emission control system or device as a result of fueling the tank.

(3) Connect the prescribed fuel tank thermocouple to the recorder and record the fuel and ambient temperatures at a chart speed of approximately 12 inches per hour (or equivalent record). Plug the exhaust pipe(s) and inlet pipe to the air cleaner and when the fuel temperature reaches 60°F±2°F install the prescribed vapor collection systems on all fuel system external vents. Multiple vents may be connected to a single collection trap provided that, where there is more than one external vent on a fuel system distinguishing between carburetor and tank vapors, separate collection systems shall be employed to trap the vapors from the separate sources. Every precaution shall be taken to minimize the lengths of the collection tubing employed and to avoid sharp bends across the entire system.

(4) Artificial means shall be employed to heat the fuel in the tank to 84°F±2°F. The prescribed temperature of the fuel shall be achieved over a period of 60 minutes ±10 minutes at a constant rate of change of temperature with respect to time. After a minimum of one hour following admittance to the 68°F–86°F soak area, the vehicle shall be moved onto the dynamometer stand for the subsequent part of the test. The fuel tank thermocouple may be temporarily disconnected to permit moving the test vehicle. Plugs shall be removed from the exhaust pipe(s) and inlet pipe to the air cleaner.

§ 86.177–10 Dynamometer driving schedule.

(a) The dynamometer driving schedule to be followed consists of a nonrepetitive series of idle, acceleration, cruise, and deceleration modes of various time sequences and rates. The driving schedule is defined by a smooth transition through the speed vs. time relationships listed in Appendix I. The time sequence begins upon starting the vehicle according to the startup procedure described in § 86.177–15.

(b) The speed tolerance at any given time on the dynamometer driving schedule prescribed in Appendix I or as printed on a driver's aid chart approved by the Administrator, when conducted to meet the requirements of § 86.177–11, is defined by upper and lower limits. The upper limit is 2 m.p.h. higher than the highest point on the trace within 1 second of the given time. The lower limit is 2 m.p.h. lower than the lowest point on the trace within 1 second of the given time. Speed variations greater than the tolerances (such as occur when shifting manual transmission vehicles) are acceptable provided they occur for less than 2 seconds on any one occasion. Speeds lower than those prescribed are acceptable provided the vehicle is operated at maximum available power during such occurrences. Further, speed deviations from those prescribed due to stalling are acceptable provided the provisions of § 86.177–15(d) are adhered to. When conducted to meet the requirements of § 86.177–8, the speed tolerance shall be as specified above, except that the upper and lower limits shall be 4 m.p.h.

§ 86.177–11 Dynamometer procedure.

(a) The dynamometer run consists of two tests, a "cold" start test after a minimum 12-hour soak (according to the provisions of §§ 86.177–8, and 86.-177–9 for gasoline-fueled vehicles) and a "hot" start test with a 10-minute soak between the two tests. Engine startup (with all accessories turned off), operation over the driving schedule, and engine shutdown make a complete cold start test. Engine startup and operation over the first 505 seconds of the driving schedule complete the hot start test. The exhaust emissions are diluted with air to a constant volume and a portion is sampled continuously during each test. (Diesel hydrocarbons are analyzed continuously.) The composite (flow integrated) samples collected in bags are analyzed for hydrocarbons, (except Diesel), carbon monoxide, carbon dioxide, and oxides of nitrogen. A parallel sample of the dilution air is similarly analyzed for hydrocarbon, carbon monoxide, and oxides of nitrogen.

(b) During the dynamometer operation, a fixed speed cooling fan shall be positioned so as to direct cooling air to the vehicle in an appropriate manner with the engine compartment cover open. The fan capacity shall normally not exceed 5,300 c.f.m. If, however, the manufacturer can show that during field operation the vehicle receives additional cooling, the fan capacity may be increased or additional fans used if approved in advance by the Administrator.

In the case of vehicles with front engine compartments, the fan(s) shall be squarely positioned between 8 and 12 inches in front of the cooling air inlets (grill). In the case of vehicles with rear engine compartments (or if special designs make the above impractical, the cooling fan(s) shall be placed in a position to provide sufficient air to maintain engine cooling.

(c) The vehicle shall be nearly level when tested in order to prevent abnormal fuel distribution.

(d) Flywheels, electrical, or other means of stimulating inertia as shown in the following table shall be used. If the equivalent inertia specified is not available on the dynamometer being used, the next higher equivalent inertia (not to exceed 250 lbs.) available shall be used.

Loaded vehicle weight (pounds)	Equivalent inteia weight (pounds)	Road load power at 50 m.p.h. (horsepower)
Up to 1,125	1,000	5.9
1,126 to 1,375	1,250	6.5
1,376 to 1,625	1,500	7.1
1,626 to 1,875	1,750	7.7
1,876 to 2,125	2,000	8.3
2,126 to 2,375	2,250	8.9
2,376 to 2,625	2,500	9.4
2,626 to 2,875	2,750	9.9
2,876 to 3,250	3,000	10.5
3,251 to 3,750	3,500	11.2
3,751 to 4,250	4,000	11.9
4,251 to 4,750	4,500	12.7
4,751 to 5,250	5,000	13.4
5,251 to 5,750	5,500	13.9
5,751 to above	5,500	14.4

(e) Power absorption unit adjustment.

(1) The power absorption unit shall be adjusted to reproduce road load power at 50 m.p.h. true speed. The indicated road load power setting shall take into account the dynamometer friction. The relationship between road load (absorbed) power and indicated road load power for a particular dynamometer shall be determined by the procedure outlined in Appendix II or other suitable means.

(2) The road load power listed above shall be used or the vehicle manufacturer may determine the road load power by an alternate procedure requested by the manufacturer and approved in advance by the Administrator, or the vehicle manufacturer may determine the road load power by the following procedure and request its use:

(i) Gasoline-fueled vehicles.

(A) Measuring the absolute manifold pressure of a representative vehicle, of the same equivalent inertia weight class, when operated on a level road under balaced wind conditions at a true speed of 50 m.p.h., and

(B) Noting the dynamometer indicated road load horsepower setting required to reproduce that manifold pressure when the same vehicle is operated on the dynamometer at a true speed of 50 m.p.h. The tests on the road and on the dynamometer shall be performed with the same vehicle ambient absolute pressure (usually barometric), i.e., within ±5 mm. Hg.

(C) The road load power shall be determined according to the procedure outlined in Appendix II and adjusted according to the following if applicable.

(ii) Diesel vehicles.

(A) Measuring the fuel flow rate of a representative vehicle of the same equivalent inertia weight class, when operated on a level road under balanced wind conditions at a true speed of 50 m.p.h., and

(B) Noting the dynamometer indicated road load horsepower setting required to reproduce that fuel flow rate when the same vehicle is operated on the dynamometer at a true speed of 50

m.p.h. The tests on the road and on the dynamometer shall be performed with the same vehicle ambient absolute pressure (usually barometric), i.e., within ±5 mm. Hg.

(C) The road load power shall be determined according to the procedure outlined in Appendix II and adjusted according to the following if applicable.

(3) Where it is expected that more than 33 percent of the vehicles in an engine family will be equipped with air conditioning, the road load power listed above or as determined in paragraph (e)(2) of this section shall be increased by 10 percent for testing all test vehicles representing such engine family if those vehicles are intended to be offered with air conditioning in production.

(f) The vehicle speed (m.p.h.) as measured from the dynamometer rolls shall be used for all conditions. A speed vs. time recording, as evidence of dynamometer test validity, shall be supplied on request of the Administrator.

(g) Practice runs over the prescribed driving schedule may be performed at test points, provided an emission sample is not taken, for the purpose of finding the minimum accelerator pedal action to maintain the proper speed-time relationship, or to permit sampling system adjustments to comply with § 86.177–16(a)(2)(ii) or § 86.177–16(b)(2)(ii).

NOTE: When using two-roll dynamometers a truer speed-time trace may be obtained by minimizing the rocking of the vehicle in the rolls. The rocking of the vehicle changes the tire rolling radius on each roll. The rocking may be minimized by restraining the vehicle horizontally (or nearly so) by using a cable and winch.

(h) The drive wheel tires may be inflated up to 45 p.s.i.g. in order to prevent tire damage. The drive wheel tire pressure shall be reported with the test results.

(i) If the dynamometer has not been operated during the 2-hour period immediately preceding the test it shall be warmed up for 15 minutes by operating it at 30 m.p.h. using a nontest vehicle.

(j) If the dynamometer horsepower must be adjusted manually, it shall be set within one hour prior to the exhaust emissions test phase. The test vehicle shall not be used to make this adjustment. Dynamometers using automatic control of preselectable power settings may be set anytime prior to the beginning of the emissions test.

§ 86.177–12 Manual transmissions.

(a) All test conditions except as noted shall be run according to the manufacturer's recommendation to the ultimate purchaser.

(b) Vehicles equipped with free wheeling or overdrive shall be tested with these features operated according to the manufacturer's recommendations to the ultimate purchaser.

(c) Idle shall be run with transmission in gear and with clutch disengaged (except first idle; see § 86.177–15).

(d) The vehicle shall be driven with minimum accelerator pedal movement to maintain the desired speed.

(e) Acceleration modes shall be driven smoothly following the shift speeds and procedure as recommended by the manufacturer to the ultimate purchaser. The operator shall release the accelerator pedal during the shift, and accomplish the shift with minimum closed throttle time. If the vehicle cannot accelerate at the specified rates, the vehicle shall be operated with the accelerator pedal fully depressed until the vehicle speed reaches the speed at which it should be at that point during the test.

(f) The deceleration modes shall be run with clutch engaged and without shifting gears from the previous mode, using brakes or accelerator pedal as necessary to maintain the desired speed. For those modes which decelerate to zero, the clutch shall be depressed when the speed drops below 15 m.p.h., when engine roughness is evident, or when engine stalling is imminent.

(g) Downshifting is allowed at the beginning of or during a power mode in accordance with the manufacturer's recommendation to the ultimate purchaser.

(h) If the transmission ratio in first gear exceeds 5:1, follow the procedure as recommended by the manufacturer to the ultimate purchaser for the use of first gear.

§ 86.177–13 [Reserved]

§ 86.177–14 Automatic transmissions.

(a) All test conditions shall be run according to the manufacturer's recommendation to the ultimate purchaser.

(b) Idle modes shall be run with the transmission in "Drive" and the wheels braked (except first idle: see § 86.177–15).

(c) The vehicle shall be driven with minimum accelerator pedal movement to maintain the desired speed.

(d) Acceleration modes shall be driven smoothly allowing the transmission to shift in accordance with the manufacturer's recommendations to the ultimate purchaser. If the vehicle cannot accelerate at the specified rates, the vehicle shall be operated with the accelerator pedal fully depressed until the vehicle speed reaches the speed at which it should be at that point during the driving schedule.

(e) The deceleration modes shall be run in gear using brakes or accelerator pedal as necessary to maintain the desired speed.

(f) Vehicles equipped with free wheeling or overdrive shall be tested with these features operated according to the manufacturer's recommendation to the ultimate purchaser.

§ 86.177–15 Engine starting and restarting.

(a) *Gasoline-fueled vehicles.* Paragraph (a) of this section applies to gasoline-fueled vehicles.

(1) The engines shall be started according to the manufacturer's recommended starting procedures. The initial 20-second idle period shall begin when the engine starts.

(2) Choke operation. (i) Vehicles equipped with automatic chokes shall be operated according to the instructions which will be included in the manufacturer's operating instructions or owner's manual including choke setting and "kick-down" from cold fast idle. The transmission shall be placed in gear 15 seconds after the engine is started. If necessary, braking may be employed to keep the drive wheels from turning.

(ii) Vehicles equipped with manual chokes shall be operated according to the manufacturer's instructions to the ultimate purchaser in the owner's manual. The transmission shall be placed in gear 15 seconds after the engine is started. If necessary, braking may be employed to keep the drive wheels from turning.

(3) The operator may use the choke, accelerator pedal, etc. where necessary to keep the engine running.

(4) If the manufacturer's operating or owner's manual does not specify a warm engine starting procedure, the engine (automatic and manual choke engines) shall be started by depressing the accelerator pedal about half way and cranking the engine until it starts.

(b) *Diesel vehicles.* Paragraph (b) of this section applies to Diesel vehicles.

(1) The engine shall be started according to the manufacturer's recommended starting procedures. The initial 20-second idle period shall begin when the engine starts. The transmission shall be placed in gear 15 seconds after the engine is started. If necessary, braking may be employed to keep the drive wheels from turning.

(c) If the vehicle does not start after 10 seconds of cranking, cranking shall cease and the reason for failure to start shall be determined. The revolution counter on the constant volume sampler (and the hydrocarbon integrator when testing Diesel vehicles, see § 86.177–20) shall be turned off and the sample solenoid valves placed in the "dump" position during this diagnostic period. In addition, either the positive displacement pump should be turned off or the exhaust tube disconnected from the tailpipe during the diagnostic period. If failure to start is an operational error, the vehicle shall be rescheduled for testing from a cold start. If failure to start is caused by vehicle malfunction, corrective action of less than 30 minutes duration may be taken and the test continued. The sampling system shall be reactivated at the same time cranking is started. When the engine starts, the driving schedule timing sequence shall begin. If failure to start is caused by vehicle malfunction and the vehicle cannot be started, the test shall be voided, the vehicle removed from the dynamometer, corrective action taken, and the vehicle rescheduled for test. The reason for the malfunction (if determined) and the corrective action taken shall be reported.

(d) If the engine "false starts," the operator shall repeat the recommended starting procedure (such as resetting the choke, etc.)

(e) Stalling. (1) If the engine stalls during an idle period, the engine shall be

restarted immediately and the test continued. If the engine cannot be started soon enough to allow the vehicle to follow the next acceleration as prescribed, the driving schedule indicator shall be stopped. When the vehicle restarts, the driving schedule indicator shall be reactivated.

(2) If the engine stalls during some operating mode other than idle, the driving schedule indicator shall be stopped, the vehicle restarted, accelerated to the speed required at that point in the driving schedule and the test continued.

(3) If the vehicle will not restart within one minute, the test shall be voided, the vehicle removed from the dynamometer, corrective action taken, and the vehicle rescheduled for test. The reason for the malfunction (if determined), and the corrective action taken shall be reported.

§ 86.177–16 Sampling and analytical system (exhaust emissions).

(a) *Gasoline-fueled vehicles.* The sampling and analytical systems for gasoline-fueled vehicles shall comply with paragraph (a) of this section:

(1) Schematic drawings. The following figures (Figs. B77–1 and B77–2) are schematic drawings of the exhaust gas sampling and analytical systems which will be used for testing under the regulations in this part. Since various configurations of the required components can produce accurate results, these schematic drawings are not to be interpreted literally and exact conformance is not mandatory. Additional components such as instruments, valves, solenoids, pumps, and switches may be used to provide additional information and coordinate the functions of the component systems.

(2) Component description (exhaust gas sampling system). The following components will be used in the exhaust gas sampling systems for testing under the regulations in this subpart. See figure B77–1. Other types of constant volume samplers may be used if shown to yield equivalent results and if approved in advance by the Administrator.

(i) A dilution air filter assembly consisting of a particulate (paper) filter to remove solid matter from the dilution air and thus increase the life of the charcoal filter; a charcoal filter to reduce and stabilize the background hydrocarbon level; and a second particulate filter to remove charcoal particles from the air stream.

(ii) A leak-tight connector and tube to the vehicle tailpipe. The tubing shall be sized and connected in such a manner that the static pressure variations in the vehicle tailpipe(s) remain within ±5 inches of water of the static pressure variations measured during a dynamometer driving cycle with no connection to the tailpipe(s). Sampling systems capable of tolerances of ±1 inch of water will be used by the Administrator if a written request by the manufacturer substantiates the need for this closer tolerance.

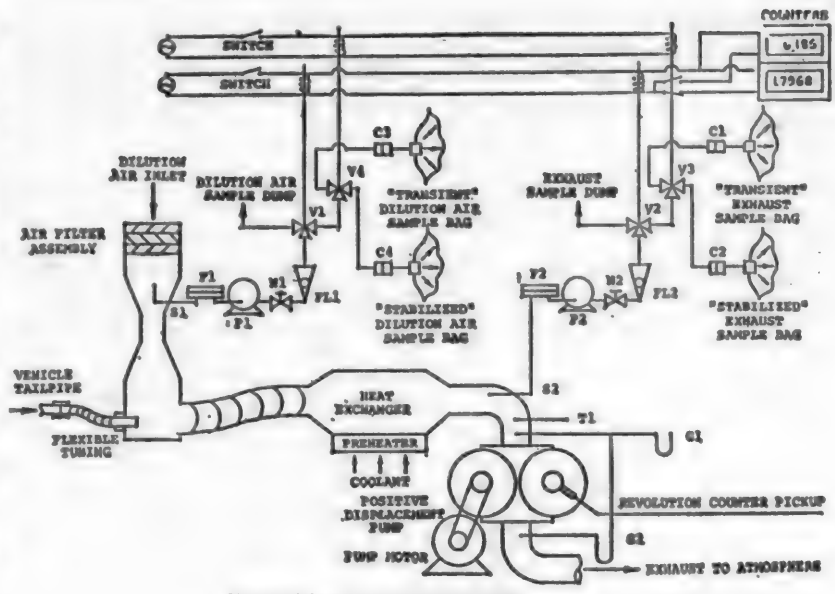


Figure B 77-1 – Exhaust Gas Sampling System

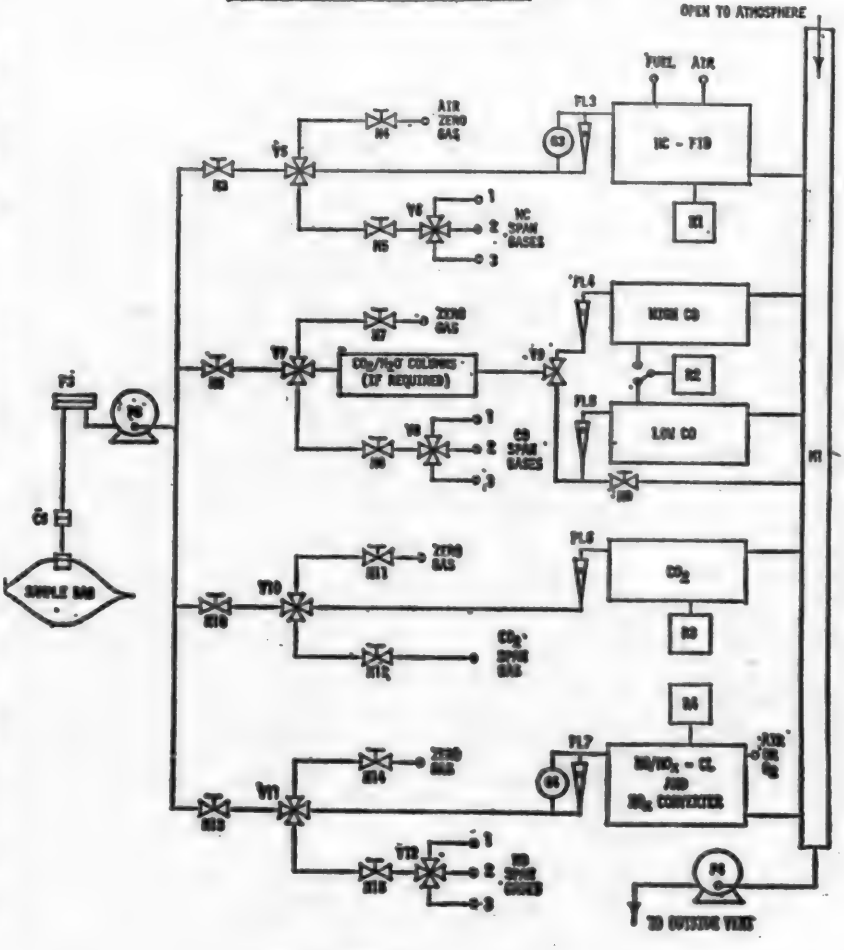


Figure B 77-2 Exhaust Gas Analytical System

(iii) A heating system to preheat the heat exchanger to within ±10°F of its operating temperature before the test begins.

(iv) A heat exchanger capable of limiting the gas mixture temperature variation during the entire test to ±10°F as measured at a point immediately ahead of the positive displacement pump.

(v) A positive displacement pump to pump the dilute exhaust mixture. The pump capacity (300 to 350 c.f.m. is sufficient for testing most vehicles) shall be large enough to virtually eliminate water condensation in the system. See Appendix III for one flow calibration technique. Other suitable calibration techniques may be used if approved in advance by the Administrator.

(vi) Temperature sensor (T1) with an accuracy of ±2°F to allow continuous recording of the temperature of the dilute exhaust mixture entering the positive displacement pump. (See § 86.177-18(1)).

(vii) Gauge (G1) with an accuracy of ±3 mm. Hg to measure the pressure depression of the dilute exhaust mixture entering the positive displacement pump, relative to atmospheric pressure.

(viii) Gauge (G2) with an accuracy of ±3 mm. Hg to measure the pressure increase across the positive displacement pump.

(ix) Sample probes (S1 and S2) pointed upstream to collect samples from the dilution airstream and the dilute exhaust mixture.

(x) Filters (F1 and F2) to remove particulate matter from dilution air and dilute exhaust samples.

(xi) Pumps (P1 and P2) to pump the dilution air and dilute exhaust into their respective sample collection bags.

(xii) Flow control valves (N1 and N2) to regulate flows to sample collection bags, at constant flow rates. The minimum sample flow rate shall be 10 c.f.h.

(xiii) Flowmeters (FL1 and FL2) to insure, by visual observation, that constant flow rates are maintained throughout the test.

(xiv) Three-way solenoid valves (V1, V2, V3, and V4) to direct sample streams to either their respective bags or overboard.

(xv) Quick-connect, leak-tight fittings (C1, C2, C3, and C4) with automatic shutoff on bag side to attach sample bags to sample system.

(xvi) Sample collection bags for dilution air and exhaust samples of sufficient capacity so as not to impede sample flow.

(xvii) Revolution counters to count the revolutions of the positive displacement pump while each test phase is in progress and samples are being collected.

(3) Component description (exhaust gas analytical system). The following components will be used in the exhaust gas analytical system for testing under the regulations in this part. The analytical system provides for the determination of hydrocarbon concentrations by flame ionization detector (FID) analysis, the determination of carbon monoxide and carbon dioxide concentrations by nondispersive infrared (NDIR) analysis and the determination of oxides of nitrogen concentrations by chemiluminescence (CL) analysis in dilute exhaust samples. The CL method of analysis requires that the nitrogen dioxide present in the sample be converted to nitric oxide before analysis. Other types of analyzers may be used if shown to yield equivalent results and if approved in advance by the Administrator. See Figure B77-2.

(i) Quick-connect leak-tight fitting (C5) to attach sample bags to analytical system.

(ii) Filter (F3) to remove any residual particulate matter from the collected sample.

(iii) Pump (P3) to transfer samples from the sample bags to the analyzers.

(iv) Selector valves (V5, V6, V7, V8, V9, V10, V11, and V12) for directing samples, span gases, or zeroing gases to the analyzers.

(v) Flow control valves (N3, N4, N5, N6, N7, N8, N9, N10, N11, N12, N13, N14, and N15) to regulate the gas flow rates.

(vi) Flowmeters (FL3, FL4, FL5, FL6, and FL7) to indicate gas flow rates.

(vii) Pressure gauges (G3 and G4) to facilitate greater precision in setting and reading flowrates.

(viii) Manifold (M1) to collect the expelled gases from the analyzers.

(ix) Pump (P4) to transfer expelled gases from the collection manifold to a vent external to the test room (optional).

(x) Analyzers to determine hydrocarbon, carbon monoxide, carbon dioxide, and oxides of nitrogen concentrations. See § 86.177-19(a).

(xi) Sample conditioning column containing $CaSO_4$ or indicating silica gel to remove water vapor and containing ascarite to remove carbon dioxide from the CO analysis stream.

NOTE: If CO instruments which are essentially free of CO_2 and water vapor interference are used, the use of the conditioning column may be deleted. See §§ 86.177-18(h) and 86.177-22(c). A CO instrument will be considered to be essentially free of CO_2 and water vapor interference if its response to a mixture of 3 percent CO_2 and N_2 which has been bubbled through water at room temperature (68°-86°F), produces an equivalent CO response, as measured on the most sensitive CO range, which is less than 1 percent of full scale CO concentration on instrument ranges above 300 ppm CO or less than 3 ppm on instrument ranges below 300 ppm CO.

(xii) Recorders (R1, R2, R3, and R4) or digital printers to provide permanent records of calibration, spanning, and sample measurements; or in those facilities where computerized data acquisition systems are incorporated, the computer facility printout may be used.

(b) *Diesel vehicles.* The sampling and analytical systems for exhaust emissions tests on Diesel light-duty vehicles and Diesel light-duty trucks shall comply with paragraph (b) of this section:

(1) Schematic drawings. The following figures B77-3, B77-4, and B77-5 are schematic drawings of the exhaust gas sampling and analytical systems which will be used for testing under the regulations in this part. Since various configurations of the required components can produce accurate results, these schematic drawings are not to be interpreted literally and exact conformance is not mandatory. Additional components such as instruments, valves, solenoids, pumps, and switches may be used to provide additional information and coordinate the functions of the component systems.

(2) Component description (exhaust gas sampling system). The following components will be used in the exhaust gas sampling system for testing under the regulations in this part. See Figure B77-3. Other types of constant volume samplers may be used if shown to yield equivalent results, and if approved in advance by the Administrator.

(i) A dilution air filter assembly consisting of a particulate (paper) filter to remove solid matter from the dilution air and thus increase the life of the charcoal filter; a charcoal filter to reduce and stabilize the background hydrocarbon level; and a second particulate filter to remove charcoal particles from the air stream.

(ii) A leak-tight connector and tube to the vehicle tailpipe. The tubing shall be sized and connected in such a manner that the static pressure variations in the vehicle tailpipe(s) remain within ±5 inches of water of the static pressure variations measured during a dynamometer driving cycle with no connection to the tailpipe(s). Sampling systems capable of tolerances of ±1 inch of water will be used by the Administrator if a written request by the manufacturer substantiates the need for this closer tolerance.

(iii) A heating system to preheat the heat exchanger to within ±10°F of its operating temperature before the test begins.

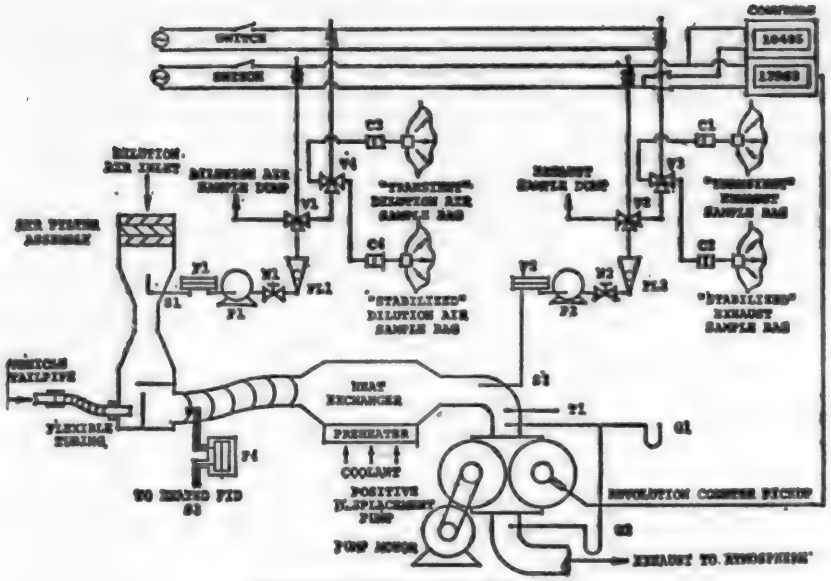


Figure 3-77-5 Exhaust Gas Sampling System

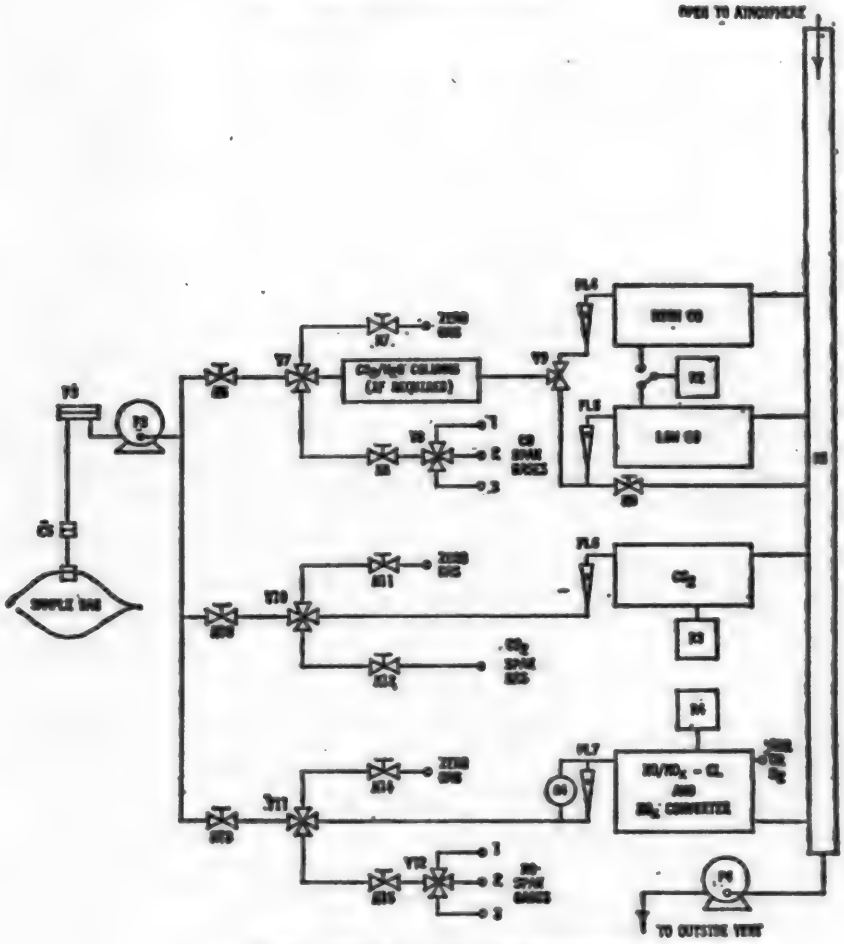


Figure 3-77-6 Exhaust Gas Analytical System

(iv) A heat exchanger capable of limiting the gas mixture temperature variation during the entire test to ±10°F as measured at a point immediately ahead of the positive displacement pump.

(v) A positive displacement pump to pump dilute exhaust mixture. The pump capacity (300 to 350 c.f.m. is sufficient for testing most vehicles) shall be large enough to virtually eliminate water condensation in the system. See Appendix III to this part for one flow calibration technique. Other suitable calibration techniques may be used if approved in advance by the Administrator.

(vi) Temperature sensor (T1) with an accuracy of ±2°F to allow continuous recording of the temperature of the dilute exhaust mixture entering positive displacement pump. (See § 86.177-18(1)).

(vii) Gage (G1) with an accuracy of ±3 mm. Hg to measure the pressure depression of the dilute exhaust mixture entering the positive displacement pump, relative to atmospheric pressure.

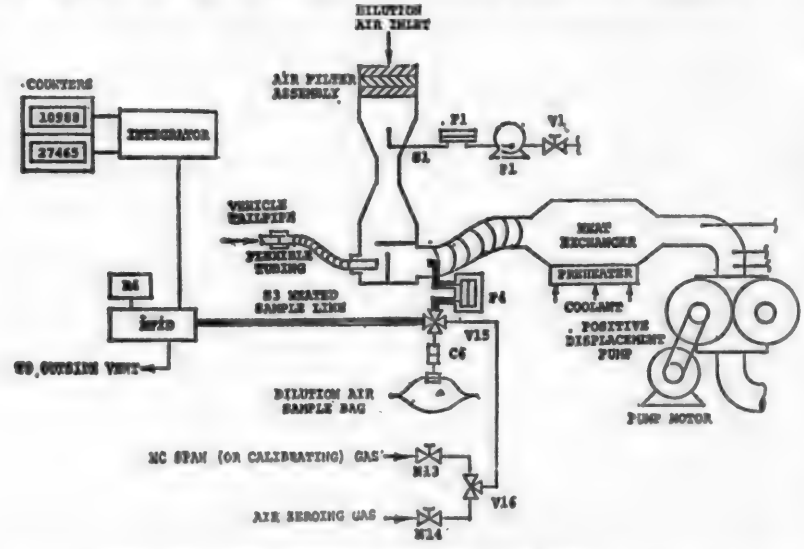


Figure B 77-3 Diesel Hydrocarbon Continuous Analysis System

(viii) Gage (G2) with an accuracy of ±3mm. Hg to measure the pressure increase across the positive displacement pump.

(ix) Sample probes (S1, S2, and S3) pointed upstream to collect samples from the dilution air steam and the dilute exhaust mixture. Additional sample probes may be used, if approved by the Administrator, to obtain continuous concentration traces of the dilute exhaust stream. In such case the sample flow rate, in standard cubic feet per test phase, must be added to the calculated dilute exhaust volume. The position of the sample probes in Figure B77-3 is pictorial only. The heated sample line (S3) between the sampling point and the analyzer shall be as short as possible.

(x) Filters (F1 and F2) to remove particulater matter from dilution air and dilute exhaust samples.

(xi) Pumps (P1 and P2) to pump the dilution air and dilute exhaust into their respective sample collection bags.

(xii) Flow control valves (N1 and N2) to regulate flows to sample collection bags, at constant flow rates. The minimum sample flow rate shall be 10 c.f.h.

(xiii) Flowmeters (FL1 and FL2) to insure, by visual observation, that constant flow rates are maintained throughout the test.

(xiv) Three-way solenoid valves (V1, V2, V3, and V4) to direct sample streams to either their respective bags or overboard.

(xv) Quick-connect, leak-tight fittings (C1, C2, C3, and C4) with automatic shutoff on bag side to attach sample bags to sample system.

(xvi) Sample collection bags for dilution air and exhaust samples of sufficient capacity so as not to impede sample flow.

(xvii) Revolution counters to count the revolutions of the positive displacement pump while each test phase is in progress and samples are being collected.

(3) Component description (exhaust gas batch analytical system). The following components will be used in the exhaust gas batch analytical system for testing under the regulations in this part. The analytical system provides for the determination of carbon monoxide and carbon dioxide concentrations by NDIR analysis and the determination of oxides of nitrogen concentrations by CL analysis in dilute exhaust samples. The CL method of analysis requires that the nitrogen dioxide present in the sample be converted to nitric oxide before analysis. Other type of analyzers may be used if shown to yield equivalent results and if approved in advance by the Administrator. See Figure B77-4.

(i) Quick-connect, leak-tight fitting (C5) to attach sample bags to analytical system.

(ii) Filter (F3) to remove any residual particulate matter from the collected sample.

(iii) Pump (P3) to transfer samples from the sample bags to the analyzers.

(iv) Selector valves (V7, V8, V9, V10, V11, and V12) for directing samples, span gases or zeroing gases to the analyzers.

(v) Flow control valves (N6, N7, N8, N9, N10, N11, N12, N13, N14, and N15) to regulate the gas flow rates.

(vi) Flowmeters (FL4, FL5, FL6, and FL7) to indicate gas flow rates.

(vii) Pressure gauge (G4) to facilitate greater precision in setting and reading flow rate.

(viii) Manifold (M1) to collect the expelled gases from the analyzers.

(ix) Pump (P4) to transfer expelled gases from the collection manifold to a vent external to the testroom (optional).

(x) Analyzers to determine carbon monoxide, carbon dioxide and oxides of nitrogen concentrations (See § 86.177-19 (a)).

(xi) Sample conditioning column containing $CaSO_4$, or indicating silica gel to remove water vapor and containing ascraite to remove carbon dioxide from the CO analyses stream.

NOTE: If CO instruments which are essentially free of CO_2 and water vapor interference are used, the use of the conditioning column may be deleted. See §§ 86.177-18(n) and 86.177-22(c).

A CO instrument will be considered to be essentially free of CO_2 and water vapor interference if its response to a mixture of 3 percent CO_2 in N_2 which has been bubbled through water at room temperature (68°-86°F), produces an equivalent CO response, as measured on the most sensitive CO range, which is less than 1 percent of full scale CO concentration on instrument ranges above 300 ppm CO or less than 3 ppm on instrument ranges below 300 ppm CO.

(xii) Recorders (R1, R2, and R3) or digital printers to provide permanent records of calibration, spanning and sample measurements; or in those facilities where computerized data acquisition systems are incorporated, the computer facility printout may be used.

(4) Component description (exhaust gas continuous analytical system). The following components will be used in the exhaust gas continuous analytical system for testing under the regulations in this part. This analytical system provides for the continuous determination of exhaust hydrocarbon concentration by heated flame ionization detector (HFID) analysis. Other types of analyzers may be used if shown to yield equivalent results and if approved in advance by the Administrator. See Figure B77-5.

(i) Heated continuous sampling line (S3).

(ii) Heated filter (F4) to remove particulate matter from heated hydrocarbon sample.

(iii) Selector valves (V5 and V6) for directing the continuous dilute exhaust sample, dilution air bag sample, span, or zeroing gases to the analyzers.

(iv) Quick-connect, leak-tight fitting (C6) to attach dilution air sample bag to analytical system.

(v) Heated hydrocarbon analyzer (HFID) complete with heated pump, filter, and flow control system. The re-

sponse time of this instrument shall be less than 1 second for 90 percent of full-scale response. Sample transport time from sampling point to inlet of instrument shall be less than 4 seconds.

(vi) Chart recorder (R1) and analog integrator with two readouts, or chart recorder (R1) and on-line digital computer for manual or electronic integration of analyzer output signal during the three operating phases of the test.

(vii) Flow control valves (N4 and N5) to regulate the gas flow rates.

§ 86.177–17 Sampling and analytical system (fuel evaporative emissions, gasoline-fueled vehicles).

(a) *Schematic drawing.* (1) The following figures (Figures B77–6, B77–7, B77–8) are flow diagrams of typical evaporative loss collection applications.

(2) Figure B77–6 represents an arrangement for collecting losses which emanate from the carburetor. Figure B77–7 depicts the means for separately collecting the vapors which emanate from the fuel tank vent line and filler cap. Figure B77–8 shows an arrangement for collecting the losses from a closed fuel system, vented to the atmosphere solely through the air cleaner, as might be the case with certain fuel evaporative emission control devices.

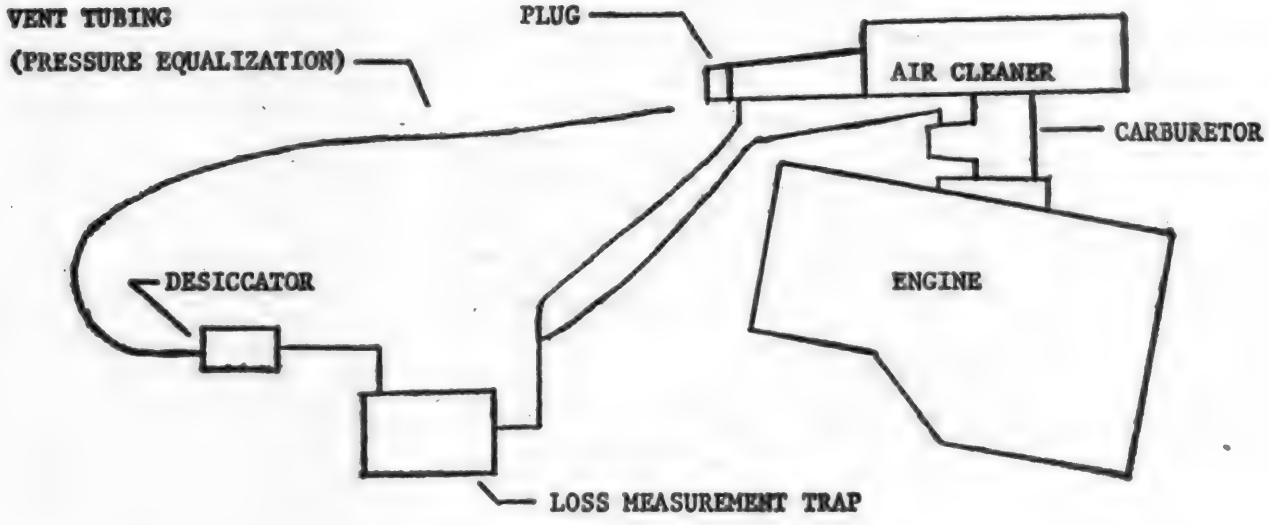


FIGURE B 77–6—Typical carburetor evaporative loss collection arrangement (schematic).

(3) Schematic drawings of arrangements to be employed shall be submitted in accordance with § 86.077–21(b)(3).

(b) *Collection equipment.* The following equipment shall be used for this collection of fuel evaporative emissions. (Item quantities are determined by individual test needs.)

(1) *Activated carbon trap.* See Figure B77–9 for specifications of one design; other configurations may be used: Provided, That they give demonstrably equivalent results.

(i) Canister —300±25 ml., cylindrical container having a length to diameter ratio of 1.4+0.1. An inlet tube, 5/16-inch ID and 1 inch long is sealed into the top of the canister, at its geometric center. A similar outlet tube is sealed into the wall ¼ inch from the bottom of the canister. The canister is designed to withstand an air pressure of 2 p.s.i., when sealed, without evidence of leaking when immersed in water for 30 seconds.

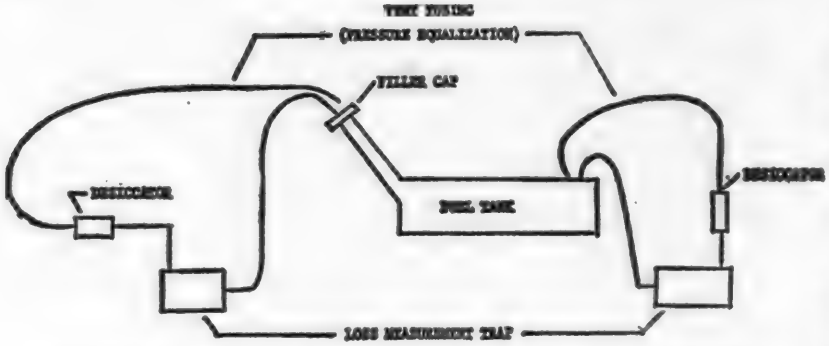


FIGURE B 77-7 - Typical fuel tank evaporative loss collection arrangement (schematic).

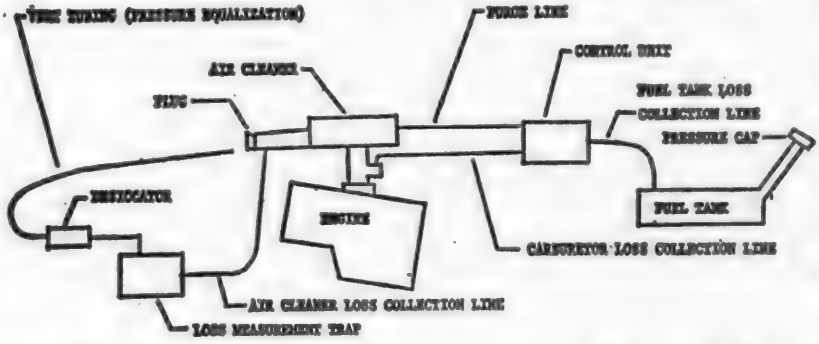


FIGURE B 77-8 - Typical fuel evaporative loss collection arrangement for vehicle equipped with evaporative emission control system (schematic).

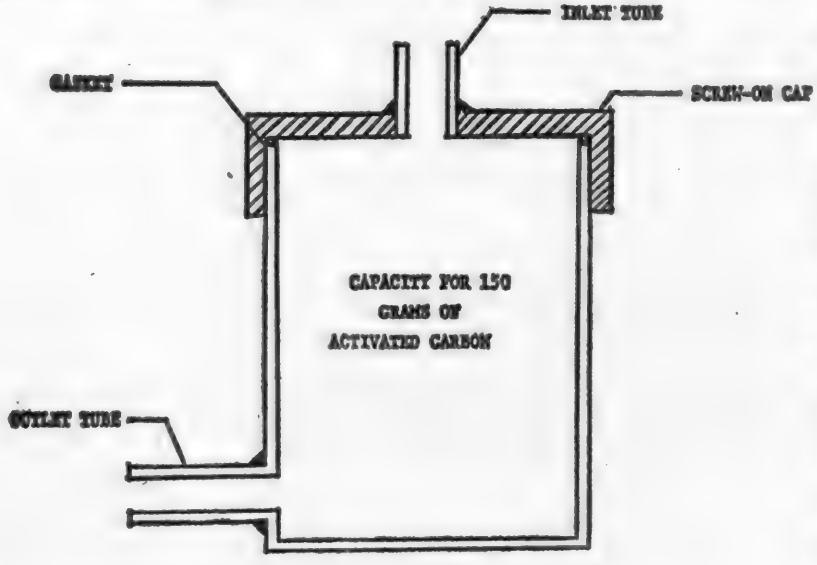


FIGURE B 77-9 - Typical activated carbon trap (schematic).

(ii) Activated carbon-meeting the following specifications:

Surface area, min. (N2 BET method),[1] 1,000 square meters per gram.

Adsorption capacity, min. (carbon tetrachloride), 60 percent, by weight.

Volatile material including adsorbed water vapor, None.

Screen analysis size:	Percent
Less than 1.4 mm	0
1.7 to 2.4 mm	90–100
More than 3 mm	0

The activated carbon trap is prepared for the test by attaching clamped sections of vinyl tubing to the inlet and outlet tubes of the canister. The canister is then filled with 150±10 g hot activated carbon which had previously been oven-dried for 3 hours at 300° F. Loss of carbon through the inlet and outlet tubes is prevented through the use of wire screens of 0.7 mm. mesh or wads of loosely packed glass wool. The canister is closed immediately after filling and the carbon is allowed to cool while the trap is vented through a drying tube via the unclamped outlet arm.

(iii) The trap is sealed and weighed after cooling and the weight, to the nearest 0.1 gram, is inscribed on the canister body. Within 12 hours of the scheduled test, the weight of the trap is checked and if it has changed by more than 0.5 gm., it is redried to constant weight. This redrying operation is performed by passing dry nitrogen, heated to 275° F, through the trap, via the inlet tube, at a rate of 1 liter per minute until checks made at 30-minute intervals do not vary by more than 0.1 percent of the gross weight. The trap and its contents are allowed to cool to room temperature, while vented through a drying tube via the outlet arm, before use.

(2) *Auxiliary collection equipment.*

(i) Drying tube—transparent, tubular body ¾-inch ID, 6 inches long, with serrated tips and removable caps.

(ii) Desiccant—indicating variety, 8 mesh. The drying tube is attached to the outlet tube of the collection traps to prevent ambient moisture from entering the trap. It is prepared by filling the empty drying tube with fresh desiccant using a loose wad of glass wool to hold the desiccant in place. The desiccant is renewed when three-quarters spent, as indicated by color change.

(iii) Collection tubing—stainless steel, aluminum, or other suitable material approved by the Administrator, 5/16-inch ID, for connecting the collection traps to the fuel system vents.

(iv) Polyvinyl chloride (vinyl) tubing—flexible tubing, 5/16-inch ID, for sealing butt-to-butt joints.

(v) Laboratory tubing—air tight flexible tubing 5/16-inch ID, attached to the outlet end of the drying tubes to equalize collection system pressure.

(vi) Clamps—hosecock, openside, for pinching off flexible tubing.

(c) *Weighing equipment.* The balance and weights used shall be capable of determining the net weight of the activated carbon trap within an accuracy of ±75 mg.

(d) *Temperature measuring equipment.* (1) Temperature recorder—multichannel, variable speed, potentiometric, or substantially equivalent, recorder with a temperature range of 50° F, to 100° F, and capable of either simultaneous or sequential recording of the ambient air and fuel temperatures within an accuracy of ±1° F.

(2) Fuel tank thermocouples—iron-constantan (type J) construction.

[1] Brunauer, Emmett & Teller: Journal of the American Chemical Society, Vol. 60, p. 309, 1938.

(3) Other types of temperature sensing systems may be provided by the manufacturer if they record the information specified in paragraph (d)(1) of this section with the required accuracy and if they are self-contained. Type J thermocouples are required for compatibility with recording instruments used in Federal certification facilities.

(e) *Assembly and use of the activated carbon vapor collection system.* (1) The prepared activated carbon trap, dried to constant weight, cooled to the ambient temperature, and sealed with clamped sections of vinyl tubing is carefully weighed to the nearest 20 milligrams and the weight recorded as the "tare weight."

(2) A drying tube is attached to the outlet tube and the clamp released, but not removed. A length of flexible tubing, for pressure equalization, is connected to the other end of the drying tube.

(3) The inlet of the adsorption trap and external vent(s) of the fuel system will be connected by minimal lengths of stainless steel or aluminum tubing and short sections of vinyl tubing. Butt-to-butt joints shall be made wherever possible and precautions taken against sharp bends in the connection lines, including any manifold systems employed to connect multiple vents to a single trap.

(4) The clamp on the inlet tube of the trap shall be released but not removed. Care shall be exercised to prevent heating the vapor collection trap by radiant or conductive heat from the engine.

(5) Upon completion of the collection sequence, the vinyl tubing sections on each arm of the collection trap shall be clamped tight and the collection system dismantled.

(6) The sealed vapor collection trap shall be weighed carefully to the nearest 20 milligrams. This constitutes the "gross weight," which is appropriately recorded. The difference between the "gross weight" and "tare weight" represents the "net weight" for purposes of calculating the fuel vapor losses.

§ 86.177–18 Information to be recorded.

The following information shall be recorded with respect to each test:

(a) Test number.

(b) System or device tested (brief description).

(c) Date and time of day for each part of the test schedule.

(d) Instrument operator.

(e) Driver or operator.

(f) Vehicle: Make—Vehicle identification number—Model year—Transmission type—Odometer reading—Engine displacement—Engine family—Idle r.p.m.—Fuel system (fuel injection, nominal fuel tank capacity, fuel tank location, number of carburetors, number of carburetor barrels, as applicable)—Inertia loading—Actual curb weight recorded at 0 miles—Actual road load horsepower at 50 m.p.h., and Drive wheel tire pressure.

(g) Indicated road load power absorption at 50 m.p.h. and dynamometer serial number. As an alternative to recording the dynamometer serial number, a reference to a vehicle test cell number may be used, with the advance approval of the Administrator, provided, the test cell records show the pertinent information.

(h) All pertinent instrument information such as tuning—gain—serial number—detector number—range. As an alternative, a reference to a vehicle test cell number may be used, with the advance approval of the Administrator, provided test cell calibration records show the pertinent instrument information.

(i) Recorder charts: Identify zero, span, exhaust gas, and dilution air sample traces.

(j) Test cell barometric pressure, ambient temperature, and humidity.

NOTE: A central laboratory barometer may be used, provided, that individual test cell barometric pressures are shown to be within ±0.1 percent of the barometric pressure at the central barometer location.

(k) Fuel temperatures, as prescribed (gasoline-fueled only).

(l) Pressure of the mixture of exhaust and dilution air entering the positive displacement pump, the pressure increase across the pump, and the temperature set point of the temperature control system. The sample temperature at the inlet to the pump may be measured, if desired, to verify that the temperature variations are within 5° F, of the set point.

(m) The number of revolutions of the positive displacement pump accumulated while the test is in progress and exhaust flow samples are being collected.

(n) The humidity of the dilution air.

NOTE: If conditioning columns are not used (see § 86.177–16(a)(3)(xi) and § 86.177–16(b)(3)(xi)), this measurement can be deleted. If the conditioning columns are used and the dilution air is taken from the test cell, the ambient humidity can be used for this measurement.

(o) Temperature set point of the heated sample line and heated hydrocarbon detector temperature control system (for Diesel vehicles only).

§ 86.177–19 Analytical system calibration and sample handling.

(a) Calibrate the analytical assembly at least once every 30 days. Use the same flow rate as when analyzing samples.

(1) Adjust analyzers to optimize performance. For Diesel vehicles, operate the heated hydrocarbon analyzer, sampling line and filter to ±10° F in the temperature range of 300 to 390°F.

(2) Zero the hydrocarbon analyzer with zero-grade air and the carbon monoxide, carbon dioxide, and oxides of nitrogen analyzers with zero-grade air or zero-grade nitrogen. The allowable zero gas impurity concentrations should not exceed 1 p.p.m. equivalent carbon response, 1 p.p.m.-carbon monoxide, 400 p.p.m. (0.04 mole percent) carbon dioxide, and 0.1 p.p.m. nitric oxide.

(3) Set the CO and CO_2 analyzer gains to give the desired ranges. Select the dedesired attenuation scale of the HC analyzer, set the sample capillary flow rate by adjusting the back pressure regulator, and adjust the electronic gain control, if provided, to give the desired range. Select the desired scale of the NOx analyzer and adjust the phototube high voltage supply or amplifier gain to give the desired range.

(4) Calibrate the HC analyzer with propane (air diluent) gases having nominal concentrations equal to 50 and 100 percent of full scale. Calibrate the CO analyzer with carbon monoxide (nitrogen diluent) gases and the CO_2 analyzer with carbon dioxide (nitrogen diluent) gases having nominal concentrations equal to 10, 25, 40, 50, 60, 70, 85, and 100 percent of full scale. Calibrate the NO_x analyzer with nitric oxide (nitrogen diluent) gases having nominal concentrations equal to 50 and 100 percent of full scale. The actual concentrations should be known to within ±2 percent of the true values.

(5) Compare values obtained on the CO and CO_2 analyzers with previous calibration curves. Any significant change reflects some problem in the system. Locate and correct problem, and recalibrate. Use best judgement in selecting curves for data reduction.

(6) NO_x converter efficiency determination: The apparatus described and illustrated in Figure B77–10 or Figure B77–11 is to be used to determine the conversion efficiency of devices that convert NO_x to NO. The following procedure is to be used for determining the values to be used in Equation (A).

(i) Attach the NO/N_2 supply (150–250 ppm) at C2, the O_2 supply at C1 and the analyzer inlet connection to the efficiency detector at C3. If lower concentrations of NO are used, air may be used in place of O_2 to facilitate better control of the NO_2 generated during step (iv).

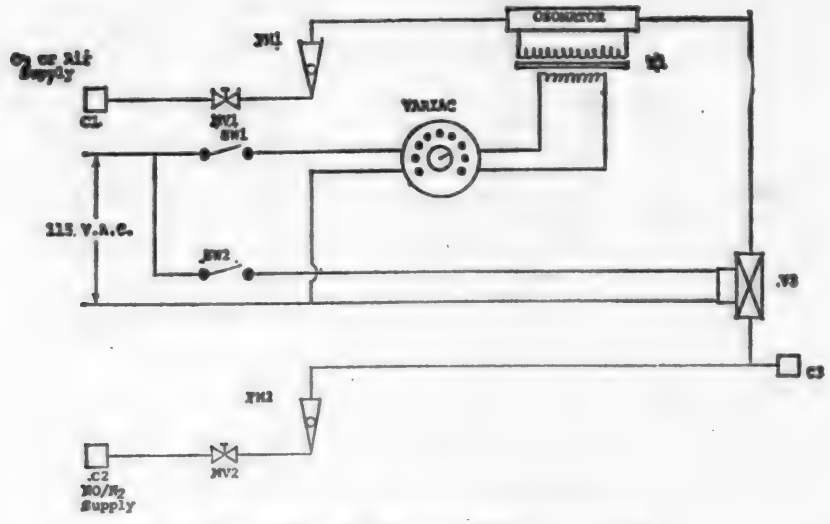


Figure 8 77-10 - NOx Converter Efficiency Detector

(ii) With the efficiency detector variac off, place the NO_x converter in bypass mode and close valve V3. Open valve MV2 until sufficient flow and stable readings are obtained at the analyzer. Zero and span the analyzer output to indicate the value of the NO concentration being used. Record this concentration.

(iii) Open valve V3 (on/off flow control solenoid valve for O_2 and adjust valve MV1 (O_2 supply metering valve) to blend enough O_2 to lower the NO concentration (ii) about 10 percent. Record this concentration.

(iv) Turn on the ozonator and increase its supply voltage until the NO concentration of (iii) is reduced to about 20 percent of (ii). NO_2 is now being formed from the NO +03 reaction. There must always be at least 10 percent unreacted NO at this point. Record this concentration.

(v) When a stable reading has been obtained from (iv), place the NO_x converter in the convert mode. The analyzer will now indicate the total NO_x concentration. Record this concentration.

(vi) Turn off the ozonator and allow the analyzer reading to stabilize. The mixture NO + O_2 is still passing through the converter. This reading is the total NO_x contration of the dilute NO span gas used at step (iii). Record this concentration.

(vii) Close valve V3. The NO concentration should be equal to or greater than the reading of (ii) indicating whether the NO contains any NO_2 Calculate the efficiency of the NO_x converter by substituting the concentrations obtained during the test into Equation (A).

Percent Eff. = (v) - (iv) / (vi) - (iv) × 100 percent (A)

The efficiency of the converter should be greater than 90 percent. Adjustment of the converter temperature may be needed to maximize the efficiency. Efficiency checks should be made on each analyzer range using an NO span gas concentration appropriate to the instrument range. See alternate procedure in paragraph (a) (6) (viii).

(viii) Alternative to paragraph (a) (6) (vii): Close valve V3. The NO concentration should be equal to or greater than the reading of (ii) indicating whether the NO contains any NO_2.

Calculate the efficiency of the NO converter by substituting the concentrations obtained during the test into Equation (B).

Percent Eff. = 1 + (v-vi) / (iii-iv) × 100 percent (B)

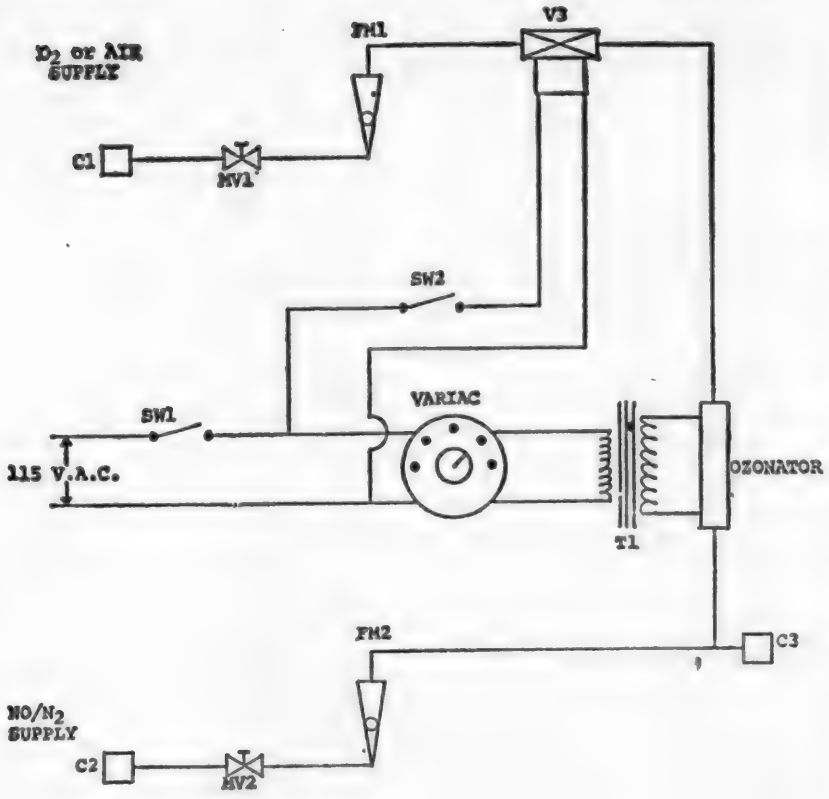


Figure B 77-11" – NOx Converter Efficiency Detector

The efficiency of the converter should be greater than 90 percent. Adjusting the converter temperature may be needed to maximize the efficiency. Although steps (ii) and (vii) are not used in the calculations, their values should be recorded to complete the data set for the test sequence. This procedure does not depend on the amount of NO_2 in the span gas nor the equivalence of flows in the bypass and converter modes; however, to be consistent with good operating practice, flows should be nominally the same, and the NO_2 concentration should be less than 5 percent of the NO_x span concentration. Efficiency checks should be made at a frequency (daily to weekly) consistent with good quality assurance provisions.

(7) Check the efficiency of the sample conditioning system, if used, by the following procedure:

(i) Zero and span the CO instrument on its most sensitive scale.

(ii) Recheck zero.

(iii) Bubble a mixture of 3 percent CO_2 in N2 through water at room temperature (68°–86° F), through the conditioning column into the CO instrument. If the response meets the criteria of § 86.-177–16(a)(3)(xi) or § 86.177–16(b)(3)(xi) as applicable, then the conditioning column is functioning acceptably. If the response is higher than the specified limit, a new conditioning column should be installed and the test repeated.

(iv) Sample conditioning systems should be checked at a frequency consistent with observed column life or when the indicator of the column packing begins to show deterioration.

(b) HC, CO, CO_2 and NO_x measurements: (When testing Diesel vehicles allow the HC analyzer sample line and filter to heat to a set point ±10° F between 300 and 390° F.) Allow a minimum of 20 minutes warmup for the HC analyzer and 2 hours for the CO, CO_2, and NO_x analyzers. (Power is normally left on infrared and CL analyzers; but when not in use, the chopper motors of the infrared analyzers are turned off and the phototube high voltage supply of the CL analyzer is placed in the standby position.) The following sequence of operations should be performed in conjunction with each series of measurements:

(1) Zero the analyzers. Obtain a stable zero on each amplifier meter and recorder. Recheck after tests.

(2) Introduce span gases and set the CO and CO_2 analyzer gains, the HC analyzer sample capillary flow rate and the NO_x analyzer high voltage supply or amplifier gain to match the calibration curves. In order to avoid corrections, span and calibrate at the same flow rates used to analyze the test samples. Span gases should have concentrations equal to approximately 80 percent of full scale. If gain has shifted significantly on the CO or CO_2 analyzers, check tuning. If necessary, check calibration. Recheck after test. Show actual concentrations on chart.

(3) Check zeros; repeat the procedure in paragraphs (b)(1) and (2) of this section if required.

(4) Check flow rates and pressures.

(5) For Diesel vehicles continuously record (and integrate electronically if desired) dilute hydrocarbon emission levels during test.

(6) Measure CO, CO_2, and NO_x concentrations of samples, also HC for gasoline-fueled vehicles. Care should be exercised to prevent moisture from condensing in the sample collection bag.

(7) Check zero and span points.

(c) For the purposes of this section, the term "zero-grade air" includes artificial "air" consisting of a blend of nitrogen and oxygen with oxygen concentrations between 18 and 21 mole percent.

§ 86.177–20 Dynamometer test runs.

(a) The vehicle shall be allowed to stand with the engine turned off for a period of not less than 12 hours before the cold-start exhaust-emission test (gasoline-fueled vehicles shall be stored at an ambient temperature specified in § 86.177–8 and § 86.177–9). The vehicle shall be stored prior to the emission tests in such a manner that precipitation (e.g. rain or dew) does not occur on the vehicle. The complete dynamometer test consists of a cold-start drive of 7.5 miles and simulates a hot-start drive of 7.5 miles. The vehicle is allowed to stand on the dynamometer during the 10-minute time period between the cold- and hot-start tests. The cold start test is divided into two periods. The first period representing the cold-start "transient" phase, terminates at the end of the deceleration which is scheduled to occur at 505 seconds of the driving schedule. The second period, representing the "stabilized" phase, consists of the remainder of driving schedule including engine shutdown. The hot-start test similarly consists of two periods. The first period, representing the hot-start "transient" phase, terminates at the same point in the driving schedule as the first phase of the cold-start test. The second period of the hot-start test, "stabilized" phase, is assumed to be identical to the second period of the cold-start test. Therefore, the hot-start test terminates after the first period (505 seconds) is run. During the tests the ambient temperature shall be between 68° F. and 86° F.

(b) The following steps shall be taken for each test:

(1) Place drive wheels of vehicle on dynamometer without starting engine.

(2) Open the vehicle engine compartment cover and start the cooling fan.

(3) With the sample solenoid valves in the "dump" position connect evacuated sample collection bags to the two

dilute exhaust sample connectors and to the two dilution air sample line connectors.

(4) Start the positive displacement pump (if not already on), the sample pumps, heated hydrocarbon analysis recorder (Diesel only), and the temperature recorder. (The heat exchanger of the constant volume sampler, the Diesel hydrocarbon analyzer continuous sample line, and filter (if applicable) should be preheated to their respective operating temperatures before the test begins.)

(5) Adjust the sample flow rates to the desired flow rate (minimum of 10 c.f.h.) and set the revolution counters to zero. Also set Diesel hydrocarbon integrator counters to zero, if applicable.

(6) Attach the flexible exhaust tube to the vehicle tailpipe(s).

(7) Simultaneously start the revolution counter for the positive displacement pump, position the sample solenoid valves to direct the sample flow into the "transient" exhaust sample bag and the "transient" dilution air sample bag, (turn on the Diesel hydrocarbon analyzer system integrator and mark the recorder chart, if applicable), and start cranking the engine.

(8) Fifteen seconds after the engine starts, place the transmission in gear.

(9) Twenty seconds after the engine starts, begin the initial vehicle acceleration of the driving schedule.

(10) Operate the vehicle according to the dynamometer driving schedule (§ 86.177–10).

(11) At the end of the deceleration which is scheduled to occur at 505 seconds, simultaneously switch the sample flows from the "transient" bags to the "stabilized" bags, switch off revolution counter No. 1 (and the Diesel hydrocarbon integrator No. 1, mark the Diesel hydrocarbon recorder chart), and start counter No. 2 (and the Diesel hydrocarbon integrator No. 2). As soon as possible and in no case longer than 20 minutes after the end of this portion of the test disconnect the "transient" exhaust and dilution air sample bags, transfer them to the analytical system and process the samples according to § 86.177–19.

(12) Turn the engine off 2 seconds after the end of the last deceleration (at 1,369 seconds).

(13) Five seconds after the engine stops running, simultaneously turn off revolution counter No. 2 (and the Diesel hydrocarbon integrator No. 2, mark the hydrocarbon recorder chart, if applicable) and position the sample solenoid valves to the "dump" position. As soon as possible and in no case longer than 20 minutes after the end of this portion of the test disconnect the "stabilized" exhaust and dilution air sample bags, transfer them to the analytical system, and process the samples according to § 86.177–19.

(14) Immediately after the end of the sample period turn off the cooling fan and close the engine compartment cover.

(15) Turn off the positive displacement pump or disconnect the exhaust tube from the tailpipe(s) of the vehicle.

(16) Repeat the steps in paragraphs (b)(2) through (10) of this section for the hot start test except only one evacuated sample bag is required for sampling exhaust gas and one for dilution air. The step in paragraph (b)(7) of this section shall begin between 9 and 11 minutes after the end of the sample period for the cold-start test.

(17) At the end of the deceleration which is scheduled to occur at 505 seconds, simultaneously turn off the No. 1 revolution counter (and Diesel hydrocarbon integrator No. 1, mark the Diesel hydrocarbon recorder chart, if applicable) and position the sample solenoid valve to the "dump" position. (Engine shutdown is not part of the hot-start test sample period.)

(18) As soon as possible and in no case longer than 20 minutes after the end of this portion of the test disconnect the hot-start "transient" exhaust and dilution air sample bags, transfer them to the analytical system and process the samples according to § 86.177–19.

(19) Disconnect the exhaust tube from the vehicle tailpipe(s) and remove vehicle from dynamometer.

(20) The positive displacement pump may be turned off, if desired.

§ 86.177–21 Chart reading.

(a) *Gasoline-fueled light-duty vehicles and light-duty trucks.*

(1) Determine the HC, CO, CO_2 and NO_x concentration of the dilution air and dilute exhaust sample bags from the instrument deflections or recordings making use of appropriate calibration charts.

(2) Determine the average dilute exhaust mixture temperatures from the temperature recorder trace if the recorder is used.

(b) *Diesel light-duty vehicles and light-duty trucks.*

(1) Determine the HC, CO, CO_2 and NO_x concentrations of the dilution air and the CO, CO_2 and NO_x concentration of the dilute exhaust sample bags from the instrument deflections, computer printout, or recordings making use of appropriate calibration charts.

(2) Record integrated HC results, or manually integrate continuous chart. This chart provides a permanent record and can be graphically integrated if verification of the results of electronic integration is required.

(3) Determine the average dilute exhaust mixture temperatures from the temperature recorder trace if a recorder is used.

§ 86.177–22 Calculations (exhaust emissions).

The final reported test results shall be computed by use of the following formula:

(a) *For light-duty vehicles and light-duty trucks:*

$$Ywm=(0.43\ Yct+0.57\ Yht+Ys)/7.5$$

Where:

Ywm=Weighted mass emissions of each pollutant, i.e., HC, CO, or NO_x, in grams per vehicle mile.

Yct=Mass emissions as calculated from the "transient" phase of the cold start test, in grams per test phase.

Yht=Mass emissions as calculated from the "transient" phase of the hot start test, in grams per test phase.

Ys=Mass emissions as calculated from the "stabilized" phase of the cold start test, in grams per test phase.

(b) The mass of each pollutant for each phase of both the cold-start test and hot-start test is determined from the following:

(1) Hydrocarbon Mass:

$$HCmass=Vmix\times DensityHC\times \frac{HCconc}{1{,}000{,}000}$$

(2) Oxides of nitrogen Mass:

$$NO_xmass=Vmix\times DensityNO_x\times \frac{(NO_xconc}{1{,}000{,}000)}\times KH$$

(3) Carbon monoxide Mass:

$$COmass=Vmix\times DensityCO\times \frac{COconc}{1{,}000{,}000}$$

(c) Meaning of symbols:

HCmass=Hydrocarbon emissions, in grams per test phase.

DensityHC=Density of hydrocarbons in the exhaust gas, assuming an average carbon to hydrogen ratio of 1:1.85, in grams per cubic foot at 68° F. and 760 mm. Hg. pressure (16.33 g/cu. ft.).

HCconc=Hydrocarbon concentration of the dilute exhaust sample corrected for background, in p.p.m. carbon equivalent, i.e. equivalent propane x 3.

$$HCconc=HCe-HCd\ (1-1/DF)$$

Where:

HCe=Average hydrocarbon concentrations of the dilute exhaust sample as measured from the sample bag or as calculated from the integrated HC traces, in p.p.m. carbon equivalent.

HCd=Hydrocarbon concentration of the dilution air as measured in p.p.m. carbon equivalent.

NO_xmass=Oxides of nitrogen emissions, in grams per test phase.

Density NO_x=Density of oxides of nitrogen in the exhaust gas, assuming they are in the form of nitrogen dioxide, in grams per cubic foot at 68° F. and 760 mm. Hg. pressure (54.16 g/cu. ft.).

NO_xconc=Oxides of nitrogen concentration of the dilute exhaust sample corrected for background, in p.p.m.

$$NO_xconc=NO_xe-NO_xd\ (1-1/DF)$$

Where:

NO_xe=Oxides of nitrogen concentration of the dilute exhaust sample as measured, in p.p.m.

NO_xd=Oxides of nitrogen concentration of the dilution air as measured, in p.p.m.

COmass=Carbon monoxide emissions, in grams per test phase.

DensityCO=Density of carbon monoxide in grams per cubic foot at 68° F. and 760 mm. Hg pressure (32.97 g/cu. ft.).

COconc=Carbon monoxide concentration of the dilute exhaust sample corrected for background, water vapor and CO_2 extraction, in p.p.m.

$$COconc=COe-COd\ (1-1/DF)$$

Where:

COe=Carbon monoxide concentration of the dilute exhaust sample volume corrected for water vapor and carbon dioxide extraction, in p.p.m. The calculation assumes the carbon to hydrogen ratio of the fuel is 1:1.85.

$$COe=(1-0.01915\ CO2e-0.000323R)\ COem$$

Where:

COem=Carbon monoxide concentration of the dilute exhaust sample as measured in p.p.m.

CO_2e=Carbon dioxide concentration of the dilute exhaust sample, in mole percent.

R=Relative humidity of the dilution air, in percent. (see § 86.177-18(n).)

COd=Carbon monoxide concentration of the dilution air corrected for water vapor extraction, in p.p.m.

$$COd=(1-0.000322R)\ COdm$$

Where:

COdm=Carbon monoxide concentration of the dilution air sample as measured, in p.p.m.

NOTE: If a CO instrument which meets the criteria specified in § 86.177-16(a)(3)(xi) or § 86.177-16(b)(3)(xi) is used and the conditioning column has been deleted, COem can be substituted directly for COe and COdm can be substituted directly for COd.

$$DF=\frac{13.4}{CO_2e+(HC_e+CO_e)\times 10^{-4}}$$

Vmix=Total dilute exhaust volume in cubic feet per test phase corrected to standard conditions (528°R and 760 mm. Hg).

$$Vmix=Vo\times N\ (P_B-P_d)\ (528°R)\ /\ (760\ mm.\ Hg)\ (Tp)$$

Where:

Vo=Volume of gas pumped by the positive displacement pump, in cubic feet per revolution. This volume is dependent on the pressure differential across the positive displacement pump. (See calibration techniques in Appendix III).

N=Number of revolutions of the positive displacement pump during the test phase while samples are being collected.

PB=Barometric pressure in mm. Hg.

Pd=Pressure depression below atmospheric measured at the inlet to the positive displacement pump.

Tp=Average temperature of dilute exhaust entering positive displacement pump during test while samples are being collected, in degrees Rankine.

KH=Humidity correction factor.

$$KH=1/1-0.0047\ (H-75)$$

NOTE: The constant 0.0047 will be updated to reflect any data which becomes available on light-duty Diesel engine tests.

Where:

H=Absolute humidity in grains of water per pound of dry air.

$$H=((43.478)\ Ra\times Pd)/(PB-(Pd\times Ra/100))$$

Ra=Relative humidity of the ambient air, in percent.

Pd=Saturated vapor pressure, in mm. Hg at the ambient dry bulb temperature.

(d) Example calculation of mass emissions values:

(1) For the "transient" phase of the cold-start test assume Vo=0.29344 cu. ft. per revolution; N=10,485; R=48.0 percent; Ra=48.2 percent; PB≤762 mm. Hg; Pd=22.225 mm. Hg; P4=70 mm. Hg; Tp=570° R; HCe=105.8 p.p.m. carbon equivalent: NO_xe=11.2 p.pm.; COem =306.6 p.p.m.; CO_2e=1.43 percent; HCd=12.1 p.pm.; NO_xd=0.8 p.pm.; COdm=15.3 p.p.m. Then:

Vmix=(0.29344) (10,485) (762-70) (528)/ (760) (570)=2595.0 cu. ft. per test phase.

H=(43.478) (48.2) (22.225)/762-(22.225×48.2/ 100)

Kh=1/1-0.0047(62-75)=.9424.

COe=(1-0.01925(1.43)-0.000322(48)) 306.0=293.4 p.p.m.

COd=(1-0.000322(48))15.3=15.1 p.p.m.

DF=13.4/1.43+(105.8+293.4)×10-4=9.116.

HCconc=105.8-12.1(1-1/9.116)=95.03.

HCmass=(2595) (16.33) (95.03/ 1,000,000)=4.027 grams per test phase.

NO_xconc=11.2-0.8(1-1/9.116)=10.49

NO_xconc=(2595) (54.16) (10.49/1,000,000) (0.9424)=1.389 grams per test phase.

COconc=293.4-15.1(11/9.116)=280.

COmass=(2595) (32.97) (280.1,000,000)=23.96 grams per test phase.

(2) For the "stabilized" portion of the cold-start test assume that similar calculations resulted in HCmass=0.62 grams per test phase; NO_xmass=1.27 grams per test phase; and COmass=5.98 grams per test phase.

(3) For the "transient" portion of the hot-start test assume that similar calculations resulted in HCmass=0.51 grams per test phase; NO_xmass=1.38 grams per test phase; and COmass=5.01 grams per test phase.

(4) Results:

HCwm=((0.43) (4.027)+(0.57) (0.51)+0.62)/ 7.5=0.352 grams per vehicle mile.

NO_xwm=((0.43) (1.389)+(0.57) (1.38)+ 1.27)/7.5=0.354 grams per vehicle mile.

COwm=((0.43) (23.96)+(0.57) (5.01)+5.98)/ 7.5=2.55 grams per vehicle mile.

§ 86.177-23 Calculations (fuel evaporative emissions, gasoline-fueled vehicles).

The net weights of the individual collection traps employed in § 86.177-9 shall be added together to determine compliance with the fuel evaporative emission standard.

APPENDIX I—URBAN DYNAMOMETER DRIVING SCHEDULES

(a) EPA Urban Dynamometer Driving Schedule for Light-Duty Vehicles and Light-Duty Trucks.

APPENDIX I

EPA URBAN DYNAMOMETER DRIVING SCHEDULE

(Speed versus Time Sequence)

Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)
0	0.0	32	5.9	64	17.1
1	0.0	33	5.4	65	19.1
2	0.0	34	11.5	66	21.1
3	0.0	35	14.3	67	22.7
4	0.0	36	16.1	68	22.9
5	0.0	37	17.3	69	22.7
6	0.0	38	18.1	70	22.4
7	0.0	39	20.7	71	21.8
8	0.0	40	21.7	72	19.6
9	0.0	41	22.4	73	17.1
10	0.0	42	22.8	74	14.8
11	0.0	43	22.1	75	14.8
12	0.0	44	21.8	76	17.7
13	0.0	45	20.9	77	19.6
14	0.0	46	20.4	78	21.6
15	0.0	47	19.8	79	23.2
16	0.0	48	17.0	80	24.3
17	0.0	49	14.9	81	24.6
18	0.0	50	14.9	82	24.5
19	0.0	51	15.2	83	24.0
20	0.0	52	15.5	84	24.6
21	0.0	53	14.8	85	24.8

APPENDIX I—Continued

Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)
66	34.7	147	0.0	228	54.9
67	34.8	148	0.0	229	55.0
68	34.7	149	0.0	230	54.9
69	34.6	150	0.0	231	54.6
70	34.5	151	0.0	232	54.5
71	35.1	152	0.0	233	54.5
72	35.6	153	0.0	234	55.1
73	35.7	154	0.0	235	55.5
74	35.4	155	0.0	236	55.7
75	34.9	156	0.0	237	55.1
76	35.0	157	0.0	238	55.3
77	35.4	158	0.0	239	55.6
78	35.0	159	0.0	240	55.7
79	35.0	160	0.0	241	55.7
80	35.7	161	0.0	242	55.5
81	35.1	162	0.0	243	55.6
82	35.7	163	0.0	244	55.5
83	27.5	164	3.3	245	55.5
84	28.6	165	6.6	246	55.5
85	29.3	163	9.9	247	55.5
86	29.8	168	13.2	248	55.4
87	30.1	168	16.5	249	55.1
88	30.4	169	19.8	250	55.6
89	30.7	170	22.2	251	55.1
90	30.7	171	24.3	252	54.6
91	30.5	172	25.8	253	54.2
92	30.4	173	26.4	254	54.0
93	30.3	174	25.7	255	53.7
94	30.4	175	25.1	256	53.6
95	30.5	176	24.7	257	53.9
96	30.4	177	25.0	258	54.0
97	29.9	178	25.2	259	54.1
98	29.6	179	25.4	260	54.1
99	29.6	180	26.8	261	53.6
100	30.3	181	27.2	262	53.4
101	30.7	182	26.5	263	53.0
102	30.9	183	24.0	264	52.6
103	31.0	184	22.7	265	52.1
104	30.9	185	19.4	266	52.4
105	30.4	186	17.7	267	53.0
106	29.5	187	17.2	268	51.0
107	29.9	188	18.1	269	51.7
108	30.2	189	18.6	270	51.9
109	30.7	190	20.0	271	51.6
110	31.2	191	22.2	272	51.5
111	31.8	192	24.5	273	52.8
112	32.2	193	27.3	274	52.1
113	32.4	194	30.5	275	53.5
114	32.2	195	33.5	276	53.5
115	31.7	196	36.2	277	54.0
116	28.6	197	37.3	278	54.0
117	28.3	198	39.3	279	55.4
118	27.0	199	40.6	280	55.6
119	18.7	200	42.1	281	56.0
120	18.4	201	43.5	282	56.0
121	12.1	202	44.1	283	55.8
122	8.8	203	44.0	284	55.2
123	5.5	204	44.8	285	54.5
124	2.2	205	47.5	286	53.6
125	0.0	206	47.5	287	52.5
126	0.0	207	47.3	288	51.5
127	0.0	208	47.2	289	51.5
128	0.0	209	47.0	290	51.5
129	0.0	210	47.0	291	51.1
130	0.0	211	47.0	292	50.1
131	0.0	212	47.0	293	50.0
132	0.0	213	47.0	294	50.1
133	0.0	214	47.2	295	50.0
134	0.0	215	47.4	296	49.6
135	0.0	216	47.9	297	49.5
136	0.0	217	48.5	298	49.5
137	0.0	218	49.1	299	49.5
138	0.0	219	49.5	300	49.1
139	0.0	220	50.0	301	48.8
140	0.0	221	50.5	302	48.1
141	0.0	222	51.0	303	47.2
142	0.0	223	51.5	304	46.1
143	0.0	224	52.2	305	45.0
144	0.0	225	52.2	306	43.8
145	0.0	226	54.1	307	42.6
146	0.0	227	54.6	308	41.5

APPENDIX I—Continued

Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)
309	40.3	390	20.8	471	35.0
310	38.5	391	17.5	472	35.6
311	37.0	392	14.3	473	35.5
312	35.2	393	12.0	474	35.4
313	33.8	394	8.7	475	35.2
314	32.5	395	5.4	476	35.2
315	31.5	396	2.1	477	35.2
316	30.6	397	0.0	478	35.2
317	30.5	398	0.0	479	35.2
318	30.0	399	0.0	480	35.3
319	30.0	400	0.0	481	35.0
320	27.5	401	0.0	482	35.1
321	24.8	402	0.0	483	35.3
322	21.5	403	2.6	484	35.5
323	20.1	404	5.9	485	35.2
324	19.1	405	9.2	486	35.0
325	18.5	406	12.5	487	35.0
326	17.0	407	15.8	488	35.0
327	16.5	408	19.1	489	34.6
328	12.5	409	22.4	490	34.6
329	10.3	410	25.0	491	34.5
330	8.0	411	25.6	492	33.5
331	4.7	412	27.5	493	31.0
332	1.4	413	29.0	494	30.1
333	0.0	414	30.0	495	28.0
334	0.0	415	30.1	496	25.6
335	0.0	416	30.0	497	23.1
336	0.0	417	29.7	498	19.5
337	0.0	418	29.3	499	16.5
338	0.0	419	28.8	500	13.2
339	0.0	420	28.0	501	10.8
340	0.0	421	25.0	502	7.2
341	0.0	422	21.7	503	4.0
342	0.0	423	18.4	504	1.0
343	0.0	424	15.1	505	0.0
344	0.0	425	11.8	506	0.0
345	0.0	426	8.5	507	0.0
346	0.0	427	5.2	508	0.0
347	1.0	428	1.9	509	0.0
348	4.3	429	0.0	510	0.0
349	7.6	430	0.0	511	1.2
350	10.9	431	0.0	512	3.5
351	14.2	432	0.0	513	5.5
352	17.3	433	0.0	514	8.5
353	20.0	434	0.0	515	8.5
354	22.5	435	0.0	516	9.6
355	23.7	436	0.0	517	10.6
356	25.2	437	0.0	518	11.9
357	26.6	438	0.0	519	14.0
358	26.1	439	0.0	520	16.0
359	30.0	440	0.0	521	17.7
360	30.8	441	0.0	522	19.0
361	31.6	442	0.0	523	20.1
362	32.1	443	0.0	524	21.0
363	32.8	444	0.0	525	22.0
364	33.6	445	0.0	526	23.0
365	34.5	446	0.0	527	23.8
366	34.6	447	0.0	528	24.5
367	34.9	448	2.3	529	24.9
368	34.8	449	6.6	530	25.0
369	34.6	450	9.9	531	25.0
370	34.7	451	13.2	532	25.0
371	35.5	452	16.5	533	25.0
372	36.0	453	19.8	534	25.0
373	35.0	454	23.1	535	25.0
374	35.0	455	25.4	536	25.6
375	35.0	456	27.8	537	25.8
376	36.0	457	29.1	538	26.0
377	36.0	458	31.5	539	25.6
378	36.1	459	33.0	540	25.2
379	36.4	460	33.6	541	25.0
380	36.5	461	34.5	542	25.0
381	36.4	462	35.1	543	25.0
382	36.0	463	35.6	544	24.4
383	36.1	464	36.1	545	23.1
384	34.1	465	36.0	546	19.1
385	33.5	466	36.1	547	16.5
386	31.4	467	36.2	548	13.2
387	29.0	468	36.0	549	9.2
388	26.7	469	35.7	550	6.9
389	23.0	470	36.0	551	3.6

APPENDIX I—Continued

Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)
552	0.0	628	5.6	706	18.2
553	0.6	629	6.6	707	19.2
554	0.0	631	0.0	708	20.1
555	0.0	632	0.0	709	21.1
556	0.0	633	0.0	710	22.0
557	0.0	634	0.0	711	22.5
558	0.0	635	0.0	712	22.1
559	0.0	636	0.0	713	21.7
560	0.0	637	0.0	714	22.2
561	0.0	638	0.0	715	22.5
562	0.0	639	0.0	716	22.5
563	0.0	640	0.0	717	21.6
564	0.0	641	0.0	718	20.5
565	0.0	642	0.0	719	18.0
566	0.0	643	0.0	720	14.6
567	0.0	644	0.0	721	12.0
568	0.0	645	0.0	722	9.0
569	2.3	646	2.0	723	6.2
570	0.6	647	4.5	724	4.5
571	8.9	648	7.8	725	3.0
572	13.0	649	10.2	726	2.1
573	14.6	650	12.5	727	0.5
574	16.0	651	14.0	728	0.5
575	17.0	652	15.3	729	0.3
576	17.0	653	17.5	730	6.5
577	17.0	654	19.6	731	9.6
578	17.5	655	21.0	732	12.5
579	17.7	656	22.2	733	14.0
580	17.7	657	23.3	734	16.0
581	17.5	658	24.5	735	18.0
582	17.0	659	25.3	736	19.6
583	16.5	660	25.6	737	21.5
584	16.6	661	25.6	738	22.1
585	17.0	662	26.1	739	24.5
586	17.1	663	26.3	740	26.5
587	17.0	664	26.2	741	26.5
588	16.6	665	26.4	742	27.1
589	16.5	666	26.5	743	27.6
590	16.5	667	26.5	744	27 9
591	16.6	668	26.0	745	28.3
592	17.0	669	25.5	746	28.6
593	17.6	670	23.6	747	28.6
594	18.5	671	21.4	748	28.3
595	19.2	672	18.5	749	28.2
596	20.2	673	16.4	750	28.0
597	21.0	674	14.5	751	27.5
598	21.1	675	11.6	752	26.8
599	21.2	676	8.7	753	25.5
600	21.6	677	5.8	754	23.5
601	22.0	678	3.5	755	21.5
602	20.4	679	2.0	756	19 0
603	22.5	680	0.0	757	16.5
604	22.5	681	0.0	758	14.9
605	22.5	682	0.0	759	12.5
606	22.7	683	0.0	760	9.4
607	23.7	684	0.0	761	6.2
608	25.1	685	0.0	762	3.0
609	26.6	686	0.0	763	1.5
610	26.6	687	0.0	764	1.5
611	27.0	688	0.0	765	0.5
612	26.1	689	0.0	766	3.0
613	22.5	690	0.0	767	6.0
614	19.5	691	0.0	768	6.3
615	16.2	692	0.0	769	9.6
616	12.0	693	0.0	770	12.9
617	8.6	694	1.4	771	15.5
618	5.2	695	3.3	772	17.5
619	3.0	696	4.4	773	18.4
620	0.0	697	6.3	774	19.5
621	0.0	698	9.2	775	20.7
622	0.0	699	11.3	776	22.0
623	0.0	700	13.5	777	23.2
624	0.0	701	14.6	778	25.0
625	0.0	702	16.4	779	26.5
626	0.0	703	16.7	780	27.6
627	0.0	704	16.5	781	28.0
628	0.0	705	16.5	782	28.3

APPENDIX I—Continued

Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)
783	28.9	860	30.6	937	24.3
784	28.9	861	30.1	938	24.5
785	28.9	862	30.0	939	25.0
786	28.6	863	29.1	940	25.0
787	28.5	864	27.5	941	24.6
788	28.5	865	27.0	942	24.6
789	28.3	866	25.8	943	24.1
790	28.1	867	25.0	944	24.5
791	28.1	868	24.5	945	25.1
792	27.6	869	24.8	946	25.6
793	27.5	870	25.1	947	26.1
794	27.5	871	25.5	948	24.0
795	27.5	872	25.7	949	22.0
796	27.5	873	26.2	950	20.1
797	27.5	874	26.0	951	16.9
798	27.5	875	27.5	952	13.6
799	27.6	876	27.5	953	10.3
800	28.0	877	28.4	954	7.0
801	28.5	878	29.0	955	3.7
802	30.6	879	29.2	956	0.4
803	31.0	880	29.1	957	0.0
804	32.0	881	29.0	958	0.0
805	33.0	882	28.9	959	0.0
806	33.5	883	28.5	960	2.0
807	33.6	884	28.1	961	5.0
808	34.0	885	28.0	962	8.6
809	34.1	886	28.0	963	11.9
810	34.1	887	27.6	964	15.2
811	34.6	888	27.2	965	17.5
812	34.6	889	26.6	966	18.6
813	33.9	890	27.0	967	20.0
814	33.6	891	27.5	968	21.1
815	33.1	892	27.8	969	22.0
816	33.0	893	28.0	970	23.0
817	32.5	894	27.8	971	24.5
818	32.0	895	28.0	972	26.3
819	31.9	896	28.0	973	27.5
820	31.6	897	28.0	974	28.1
821	31.5	898	27.7	975	28.4
822	30.6	899	27.4	976	28.5
823	30.0	900	26.9	977	28.5
824	29.9	901	26.6	978	28.5
825	29.9	902	26.5	979	27.7
826	29.9	903	26.5	980	27.5
827	29.9	904	26.5	981	27.2
828	29.6	905	26.3	982	26.6
829	29.5	906	26.2	983	26.5
830	29.5	907	26.2	984	26.0
831	29.5	908	25.9	985	25.7
832	28.9	909	25.6	986	25.2
833	28.2	910	25.6	987	24.0
834	27.7	911	25.6	988	22.6
835	27.0	912	25.5	989	21.5
836	26.5	913	25.5	990	21.5
837	25.7	914	24.6	991	21.5
838	23.0	915	23.5	992	22.3
839	20.5	916	22.2	993	23.0
840	19.2	917	21.6	994	22.5
841	19.2	918	21.6	995	22.5
842	20.1	919	21.7	996	22.6
843	20.9	920	22.6	997	22.7
844	21.4	921	23.4	998	22.7
845	22.0	922	24.0	999	22.7
846	22.6	923	24.2	1,000	23.5
847	23.2	924	24.4	1,001	24.0
848	24.0	925	24.9	1,002	24.6
849	25.0	926	25.1	1,003	24.6
850	26.0	927	25.2	1,004	25.1
851	26.6	928	25.3	1,005	25.4
852	26.6	929	25.5	1,006	25.4
853	26.5	930	25.2	1,007	25.5
854	27.0	931	25.0	1,008	25.6
855	27.2	932	25.0	1,009	24.1
856	27.5	933	25.0	1,010	22.7
857	28.1	934	24.7	1,011	22.2
858	28.5	935	24.5	1,012	22.0
859	28.9	936	24.3	1,013	22.4

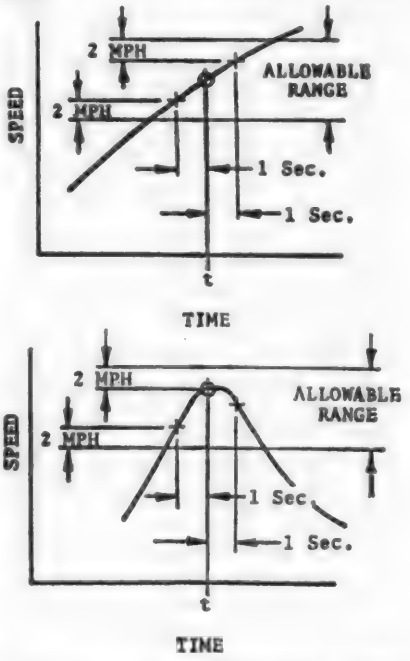
APPENDIX I—Continued

Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)
1,014	23.0	1,091	5.6	1,168	0.0
1,015	21.9	1,092	3.7	1,169	2.1
1,016	20.5	1,093	5.6	1,170	5.4
1,017	17.5	1,094	8.0	1,171	8.7
1,018	14.2	1,095	7.0	1,172	12.0
1,019	10.9	1,096	5.0	1,173	15.3
1,020	7.6	1,097	4.2	1,174	18.6
1,021	4.3	1,098	2.6	1,175	21.1
1,022	1.0	1,099	1.0	1,176	23.0
1,023	0.0	1,100	0.0	1,177	23.5
1,024	0.0	1,101	0.1	1,178	23.0
1,025	0.0	1,102	0.6	1,179	22.5
1,026	0.0	1,103	1.6	1,180	20.0
1,027	0.0	1,104	3.6	1,181	16.7
1,028	0.0	1,105	6.9	1,182	13.4
1,029	0.0	1,106	10.0	1,183	10.1
1,030	0.0	1,107	12.8	1,184	6.8
1,031	0.0	1,108	14.0	1,185	3.5
1,032	0.0	1,109	14.5	1,186	0.2
1,033	0.0	1,110	15.5	1,187	0.0
1,034	0.0	1,111	18.1	1,188	0.0
1,035	0.0	1,112	20.0	1,189	0.0
1,036	0.0	1,113	21.0	1,190	0.0
1,037	0.5	1,114	21.2	1,191	0.0
1,038	0.0	1,115	21.3	1,192	0.0
1,039	0.0	1,116	21.4	1,193	0.0
1,040	0.0	1,117	21.7	1,194	2.0
1,041	0.0	1,118	22.5	1,195	0.0
1,042	0.0	1,119	23.0	1,196	0.0
1,043	0.0	1,120	23.4	1,197	0.2
1,044	0.0	1,121	24.5	1,198	1.5
1,045	0.0	1,122	25.0	1,199	3.5
1,046	0.0	1,123	24.9	1,200	6.5
1,047	0.0	1,124	24.5	1,201	9.8
1,048	0.0	1,125	25.0	1,202	12.0
1,049	0.0	1,126	25.4	1,203	12.9
1,050	0.0	1,127	25.8	1,204	13.0
1,051	0.0	1,128	26.0	1,205	12.6
1,052	0.0	1,129	26.4	1,206	12.8
1,053	1.2	1,130	26.6	1,207	13.1
1,054	4.0	1,131	26.9	1,208	13.1
1,055	7.3	1,132	27.0	1,209	14.0
1,056	10.6	1,133	27.0	1,210	15.5
1,057	13.9	1,134	27.0	1,211	17.0
1,058	17.0	1,135	26.9	1,212	18.6
1,059	18.8	1,136	26.8	1,213	19.7
1,060	20.6	1,137	26.6	1,214	21.0
1,061	21.8	1,138	26.5	1,215	21.5
1,062	23.0	1,139	26.4	1,216	21.8
1,063	24.0	1,140	26.0	1,217	21.8
1,064	24.8	1,141	25.8	1,218	21.5
1,065	25.6	1,142	24.6	1,219	21.2
1,066	26.8	1,143	23.5	1,220	21.5
1,067	26.5	1,144	21.5	1,221	21.8
1,068	27.4	1,145	20.0	1,222	22.0
1,069	27.9	1,146	17.5	1,223	21.9
1,070	28.3	1,147	16.0	1,224	21.7
1,071	28.0	1,148	14.0	1,225	21.5
1,072	27.5	1,149	10.7	1,226	21.5
1,073	27.0	1,150	7.4	1,227	21.4
1,074	27.0	1,151	4.1	1,228	20.1
1,075	26.3	1,152	0.8	1,229	19.5
1,076	24.5	1,153	0.0	1,230	19.2
1,077	22.5	1,154	0.0	1,231	19.6
1,078	21.5	1,155	0.0	1,232	19.8
1,079	20.6	1,156	0.0	1,233	20.0
1,080	18.0	1,157	0.0	1,234	19.5
1,081	15.0	1,158	0.0	1,235	17.5
1,082	12.5	1,159	0.0	1,236	15.5
1,083	11.1	1,160	0.0	1,237	13.0
1,084	10.6	1,161	0.0	1,238	10.0
1,085	10.0	1,162	0.0	1,239	5.0
1,086	9.5	1,163	0.0	1,240	0.0
1,087	9.1	1,164	0.0	1,241	4.0
1,088	8.7	1,165	0.0	1,242	2.5
1,089	8.6	1,166	0.0	1,243	0.7
1,090	8.5	1,167	0.0	1,244	0.0

APPENDIX I—Continued

Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)	Time (sec.)	Speed (m.p.h.)
1,245	0.0	1,288	24.0	1,330	0.0
1,246	0.0	1,289	24.1	1,331	0.0
1,247	0.0	1,290	24.5	1,332	0.0
1,248	0.0	1,291	24.7	1,333	0.0
1,249	0.0	1,292	25.0	1,334	0.0
1,250	0.0	1,293	25.4	1,335	0.0
1,251	0.0	1,294	25.6	1,336	0.0
1,252	1.0	1,295	25.7	1,337	0.0
1,253	1.0	1,296	26.0	1,338	1.5
1,254	1.0	1,297	26.2	1,339	4.6
1,255	1.0	1,298	27.0	1,340	8.1
1,256	1.0	1,299	26.8	1,341	11.1
1,257	1.6	1,300	27.3	1,342	13.4
1,258	3.0	1,301	28.0	1,343	15.2
1,259	4.0	1,302	29.1	1,344	16.1
1,260	5.5	1,303	29.0	1,345	15.9
1,261	6.3	1,304	28.0	1,346	15.3
1,262	8.0	1,305	24.7	1,347	20.5
1,263	10.0	1,306	21.4	1,348	21.3
1,264	10.5	1,307	18.1	1,349	21.3
1,265	9.5	1,308	14.8	1,350	23.0
1,266	8.5	1,309	11.5	1,351	22.4
1,267	7.6	1,310	8.2	1,352	22.0
1,268	8.6	1,311	4.9	1,353	21.6
1,269	11.0	1,312	1.6	1,354	21.1
1,270	14.0	1,313	0.0	1,355	20.5
1,271	17.0	1,314	0.0	1,356	20.0
1,272	19.5	1,315	0.0	1,357	19.6
1,273	21.0	1,316	0.0	1,358	18.6
1,274	21.8	1,317	0.0	1,359	17.5
1,275	22.2	1,318	0.0	1,360	16.5
1,276	23.0	1,319	0.0	1,361	15.5
1,277	23.6	1,320	0.0	1,362	14.9
1,278	24.1	1,321	0.0	1,363	11.9
1,279	24.5	1,322	0.0	1,364	8.9
1,280	24.5	1,323	0.0	1,365	5.2
1,281	24.0	1,324	0.0	1,366	2.5
1,282	23.5	1,325	0.0	1,367	0.0
1,283	23.5	1,326	0.0	1,368	0.0
1,284	23.5	1,327	0.0	1,369	0.0
1,285	23.5	1,328	0.0	1,370	0.0
1,286	23.5	1,329	0.0	1,371	0.0
1,287	23.6				

The diagrams below show the range of acceptable speed tolerances for typical points. The curve on the left is typical of portions of the speed curve which are increasing or decreasing throughout the 2 second time interval. The curve on the right is typical of portions of the speed curve which include a maximum or minimum value.



(b) EPA Urban Dynamometer Driving Schedule for Light-Duty Vehicles, Light-Duty Trucks, and Motorcycles with engine displacements equal to or greater than 170 cc (10.4 cu. in.).

Speed Versus Time Sequence

Time (seconds):	Speed (kilometres per hour)	Time (seconds):	Speed (kilometres per hour)
0	0	37	31.9
1	0	38	27.4
2	0	39	24.0
3	0	40	24.0
4	0	41	24.5
5	0	42	24.9
6	0	43	25.7
7	0	44	27.5
8	0	45	30.7
9	0	46	34.0
10	0	47	36.5
11	0	48	36.9
12	0	49	36.5
13	0	50	36.4
14	0	51	34.3
15	0	52	30.6
16	0	53	27.5
17	0	54	25.4
18	0	55	25.4
19	0	56	28.5
20	0	57	31.9
21	4.8	58	34.8
22	9.5	59	37.3
23	13.8	60	38.9
24	18.5	61	39.6
25	23.0	62	40.1
26	27.2	63	40.2
27	27.8	64	39.6
28	29.1	65	39.4
29	33.3	66	39.8
30	34.9	67	39.9
31	36.0	68	39.8
32	36.2	69	39.6
33	35.6	70	39.6
34	34.6	71	40.4
35	33.6	72	41.2
36	32.8	73	41.4

Time (seconds):	Speed (kilometres per hour)	Time (seconds):	Speed (kilometres per hour)
74	40.9	111	51.2
75	40.1	112	51.8
76	40.2	113	52.1
77	40.9	114	51.8
78	41.8	115	51.0
79	41.8	116	46.0
80	41.4	117	40.7
81	42.0	118	35.4
82	43.0	119	30.1
83	44.3	120	24.8
84	46.0	121	19.5
85	47.2	122	14.2
86	48.0	123	8.9
87	48.4	124	3.5
88	48.9	125	0
89	49.4	126	0
90	49.4	127	0
91	49.1	128	0
92	48.9	129	0
93	48.8	130	0
94	48.9	131	0
95	48.6	132	0
96	48.9	133	0
97	48.1	134	0
98	47.5	135	0
99	48.0	136	0
100	48.8	137	0
101	49.4	138	0
102	49.7	139	0
103	49.9	140	0
104	49.7	141	0
105	48.9	142	0
106	48.9	143	0
107	48.1	144	0
108	48.6	145	0
109	49.4	146	0
110	50.2	147	0

Time (seconds)	Speed (kilometres per hour)
148	0
149	0
150	0
151	0
152	0
153	0
154	0
155	0
156	0
157	0
158	0
159	0
160	0
161	0
162	0
163	0
164	5.3
165	10.6
166	15.9
167	21.2
168	26.6
169	31.9
170	35.7
171	38.1
172	41.5
173	42.8
174	41.4
175	40.4
176	39.8
177	40.2
178	40.6
179	40.9
180	41.5
181	43.8
182	42.6
183	38.6
184	36.6
185	31.2
186	28.5
187	27.7
188	29.1
189	30.5
190	33.5
191	35.7
192	39.4
193	43.9
194	49.1
195	53.5
196	56.3
197	60.0
198	63.2
199	65.3
200	67.8
201	70.0
202	72.6
203	74.0
204	75.3
205	76.4
206	76.4
207	76.1
208	76.0
209	75.8
210	75.6
211	75.6
212	75.6
213	75.6
214	76.0
215	76.3
216	77.1
217	78.1
218	79.0
219	79.7
220	80.5
221	81.4
222	83.1
223	83.9
224	84.0
225	85.6
226	87.1
227	87.9
228	88.4
229	88.5
230	88.4
231	87.9
232	87.9
233	88.1

Time (seconds)	Speed (kilometres per hour)
234	88.7
235	89.3
236	89.6
237	90.3
238	90.6
239	91.1
240	91.2
241	91.2
242	90.9
243	90.9
244	90.9
245	90.9
246	90.9
247	90.9
248	90.8
249	90.3
250	89.8
251	88.7
252	87.9
253	87.2
254	86.9
255	86.4
256	86.3
257	86.7
258	86.9
259	87.1
260	87.1
261	86.6
262	85.9
263	85.3
264	84.7
265	83.8
266	84.3
267	83.7
268	83.5
269	83.2
270	82.9
271	83.0
272	83.4
273	83.8
274	84.5
275	85.3
276	86.1
277	86.9
278	88.4
279	89.2
280	89.5
281	90.1
282	90.1
283	89.8
284	88.8
285	87.7
286	86.3
287	84.5
288	82.9
289	82.9
290	82.9
291	82.2
292	80.6
293	80.5
294	80.8
295	80.5
296	79.8
297	79.7
298	79.7
299	79.7
300	79.9
301	78.2
302	77.4
303	76.0
304	74.2
305	72.4
306	70.5
307	68.8
308	66.8
309	64.9
310	63.0
311	60.5
312	58.6
313	56.4
314	53.8
315	50.7
316	48.2
317	45.1
318	43.8
319	40.7

Time (seconds)	Speed (kilometres per hour)
320	44.3
321	39.9
322	34.6
323	32.3
324	30.7
325	29.8
326	27.4
327	24.8
328	20.1
329	17.4
330	12.9
331	7.6
332	2.3
333	0
334	0
335	0
336	0
337	0
338	0
339	0
340	0
341	0
342	0
343	0
344	0
345	0
346	0
347	1.6
348	6.9
349	12.2
350	17.5
351	22.9
352	27.8
353	32.2
354	36.2
355	39.1
356	40.6
357	42.8
358	45.2
359	48.3
360	49.6
361	50.9
362	51.7
363	52.8
364	54.1
365	55.5
366	55.7
367	56.2
368	56.0
369	55.5
370	55.8
371	57.1
372	57.9
373	57.9
374	57.9
375	57.9
377	57.9
376	57.9
378	58.1
379	58.9
380	58.7
381	58.6
382	57.9
383	56.5
384	54.9
385	53.9
386	50.5
387	46.7
388	41.4
389	37.0
390	32.7
391	28.2
392	23.3
393	19.3
394	14.0
395	8.7
396	3.4
397	0
398	0
399	0
400	0
401	0
402	0
403	4.2
404	9.5
405	14.8

Time (seconds)	Speed (kilometres per hour)
406	20.1
407	25.4
408	30.7
409	36.0
410	40.2
411	41.3
412	44.3
413	46.7
414	48.3
415	48.4
416	48.3
417	47.8
418	47.2
419	46.5
420	45.1
421	40.2
422	34.9
423	29.6
424	24.3
425	19.0
426	13.7
427	8.4
428	3.1
429	0
430	0
431	0
432	0
433	0
434	0
435	0
436	0
437	0
438	0
439	0
440	0
441	0
442	0
443	0
444	0
445	0
446	0
447	0
448	5.3
449	10.6
450	15.9
451	21.2
452	26.6
453	31.9
454	37.2
455	42.5
456	44.7
457	46.8
458	50.7
459	53.1
460	54.1
461	56.0
462	56.5
463	57.3
464	58.1
465	57.9
466	58.1
467	58.3
468	57.9
469	57.5
470	57.9
471	57.9
472	57.3
473	57.1
474	57.0
475	56.6
476	56.6
477	56.6
478	56.6
479	56.6
480	56.6
481	56.3
482	56.5
483	56.6
484	57.1
485	56.6
486	56.3
487	56.3
488	56.3
489	56.0
490	55.7

Time (seconds)	Speed (kilometres per hour)
401	38.0
402	33.0
403	31.5
404	48.4
405	45.1
406	41.0
407	36.2
408	31.9
409	26.6
410	21.2
411	16.0
412	11.6
413	6.4
414	1.6
415	0
416	0
417	0
418	0
419	0
420	0
421	1.9
422	5.6
423	8.9
424	10.5
425	13.7
426	15.4
427	16.9
428	19.2
429	22.5
430	25.7
431	28.5
432	30.6
433	32.3
434	33.8
435	35.4
436	37.0
437	38.3
438	39.4
439	40.1
440	40.2
441	40.2
442	40.2
443	40.2
444	40.2
445	40.2
446	41.2
447	41.5
448	41.5
449	41.2
450	40.6
451	40.2
452	40.2
453	40.2
454	39.3
455	37.2
456	31.9
457	26.6
458	21.2
459	15.9
460	10.6
461	5.3
462	0
463	0
464	0
465	0
466	0
467	0
468	0
469	0
470	0
471	0
472	0
473	0
474	0
475	0
476	0
477	0
478	0
479	0
480	0
481	0
482	0
483	0
484	0
485	0
486	0
487	0
488	0
489	0
490	0
491	0
492	0
493	0
494	0
495	0
496	0
497	0
498	0
499	0
500	0
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505	0
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623	0
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628	0
629	0
630	0
631	0
632	0
633	0
634	0
635	0
636	0
637	0
638	0
639	0
640	0
641	0
642	0
643	0
644	0
645	0
646	3.2
647	7.9
648	12.6
649	16.4
650	20.1
651	23.5
652	24.6
653	28.2
654	31.5
655	33.8
656	34.7
657	37.8
658	38.4
659	40.7
660	41.8
661	41.8
662	42.9
663	43.4
664	43.3
665	42.5
666	42.6
667	42.6
668	41.5
669	41.6
670	38.0
671	34.4
672	29.6
673	26.4
674	23.5
675	18.7
676	14.0
677	9.3
678	5.6
679	3.3
680	0
681	0
682	0
683	0
684	0
685	0
686	0
687	0
688	0
689	0
690	0
691	0
692	0
693	0
694	2.3
695	5.3
696	7.1
697	10.5
698	14.5
699	18.2
700	21.7
701	23.5
702	26.4
703	28.9
704	28.6
705	28.6
706	29.2
707	30.9
708	32.3
709	34.6
710	36.2
711	36.2
712	35.6
713	36.2
714	37.5
715	37.5
716	36.2
717	34.6
718	33.0
719	29.0
720	24.1
721	19.3
722	14.5
723	10.0
724	7.2
725	4.5
726	2.4
727	0.5
728	0.5
729	3.1
730	10.5
731	15.4
732	20.1
733	22.5
734	28.7
735	29.0
736	31.5
737	34.0
738	37.0
739	39.4
740	41.0
741	42.0
742	43.0
743	44.0
744	44.0
745	45.0
746	46.0
747	46.0
748	45.5
749	46.4
750	45.1
751	44.5
752	43.1
753	41.0
754	37.5
755	34.6
756	30.6
757	26.6
758	24.0
759	20.1
760	15.1
761	10.0
762	4.8
763	2.4
764	2.4
765	0.8
766	0
767	4.8
768	10.1
769	15.4
770	20.8
771	25.4
772	29.2
773	30.6
774	31.4
775	33.3
776	35.4
777	37.3
778	40.2
779	42.6
780	44.3
781	45.1
782	45.5
783	45.5
784	45.5
785	45.5
786	45.3
787	45.9
788	45.5
789	45.5
790	45.5
791	45.4
792	44.4
793	44.3
794	44.3
795	44.3
796	44.3
797	44.3
798	44.3
799	44.4
800	45.1
801	45.9
802	48.3
803	49.9
804	51.5
805	53.1
806	53.1
807	54.1
808	54.7
809	55.3
810	55.0
811	54.7
812	54.7
813	54.6
814	54.1
815	53.3
816	53.1
817	52.3
818	51.5
819	51.3
820	50.9
821	50.7
822	49.3
823	48.3
824	48.1
825	48.1
826	48.1
827	48.1
828	47.9
829	47.5
830	47.5
831	47.9

Time (seconds)	Speed (kilometres per hour)
832	46.8
833	46.4
834	44.6
835	43.5
836	41.0
837	38.1
838	35.4
839	33.0
840	30.9
841	30.9
842	32.3
843	33.6
844	34.4
845	35.4
846	36.4
847	37.3
848	38.6
849	40.2
850	41.8
851	42.8
852	43.6
853	43.1
854	43.5
855	43.8
856	44.7
857	45.2
858	46.3
859	46.5
860	46.7
861	46.8
862	46.7
863	45.2
864	44.3
865	43.5
866	41.8
867	40.2
868	39.4
869	39.9
870	40.4
871	41.0
872	41.4
873	42.2
874	43.3
875	44.3
876	44.7
877	45.7
878	46.7
879	47.0
880	46.8
881	46.7
882	46.5
883	45.9
884	45.2
885	45.1
886	45.1
887	44.4
888	43.8
889	42.8
890	43.5
891	44.3
892	44.7
893	45.1
894	44.7
895	45.1
896	45.1
897	45.1
898	44.6
899	44.1
900	43.3
901	42.8
902	42.6
903	42.6
904	42.6
905	42.3
906	42.2
907	42.2
908	41.7
909	41.2
910	41.2
911	41.7
912	41.5
913	41.0
914	39.6
915	37.8
916	35.7
917	34.8
918	34.8
919	34.9

Time (seconds)	Speed (kilometres per hour)
920	36.4
921	37.7
922	38.6
923	38.9
924	39.3
925	40.1
926	40.4
927	40.6
928	40.7
929	41.0
930	40.6
931	40.3
932	40.2
933	40.2
934	39.8
935	39.4
936	39.1
937	39.1
938	39.4
939	40.2
940	40.3
941	39.6
942	39.6
943	38.8
944	39.4
945	40.4
946	41.2
947	40.4
948	38.6
949	35.4
950	32.3
951	27.2
952	21.9
953	16.6
954	11.3
955	6.0
956	0.6
957	0
958	0
959	0
960	3.2
961	8.5
962	13.8
963	19.2
964	24.5
965	28.2
966	29.9
967	32.2
968	34.0
969	35.4
970	37.0
971	39.4
972	42.3
973	44.3
974	45.2
975	45.7
976	45.9
977	45.9
978	45.9
979	44.6
980	44.3
981	43.8
982	43.1
983	42.6
984	41.8
985	41.4
986	40.6
987	38.6
988	35.4
989	34.6
990	34.6
991	35.1
992	36.2
993	37.0
994	36.7
995	36.7
996	37.0
997	36.8
998	36.8
999	36.6
1,000	37.8
1,001	38.6
1,002	39.6
1,003	39.9
1,004	40.4
1,005	41.0
1,006	41.6

Time (seconds)	Speed (kilometres per hour)
1,007	41.6
1,008	40.2
1,009	39.6
1,010	38.1
1,011	37.8
1,012	36.9
1,013	36.2
1,014	35.4
1,015	34.8
1,016	33.0
1,017	28.2
1,018	22.8
1,019	17.5
1,020	12.2
1,021	6.9
1,022	1.6
1,023	0
1,024	0
1,025	0
1,026	0
1,027	0
1,028	0
1,029	0
1,030	0
1,031	0
1,032	0
1,033	0
1,034	0
1,035	0
1,036	0
1,037	0
1,038	0
1,039	0
1,040	0
1,041	0
1,042	0
1,043	0
1,044	0
1,045	0
1,046	0
1,047	0
1,048	0
1,049	0
1,050	0
1,051	0
1,052	0
1,053	1.9
1,054	6.4
1,055	11.7
1,056	17.1
1,057	22.4
1,058	27.4
1,059	29.8
1,060	32.2
1,061	35.1
1,062	37.0
1,063	38.6
1,064	39.9
1,065	41.2
1,066	42.6
1,067	43.1
1,068	44.1
1,069	44.9
1,070	45.5
1,071	45.1
1,072	44.3
1,073	43.5
1,074	43.5
1,075	42.3
1,076	39.4
1,077	36.2
1,078	34.6
1,079	33.2
1,080	29.9
1,081	24.1
1,082	19.8
1,083	17.9
1,084	17.1
1,085	16.1
1,086	15.2
1,087	14.9
1,088	14.9
1,089	13.8
1,090	14.2
1,091	14.6
1,092	14.9
1,093	13.8
1,094	13.8

Time (seconds)	Speed (kilometres per hour)
1,095	11.3
1,096	8.6
1,097	6.6
1,098	4.3
1,099	1.6
1,100	0
1,101	0.2
1,102	1.6
1,103	2.9
1,104	5.8
1,105	11.1
1,106	16.1
1,107	20.6
1,108	22.6
1,109	23.3
1,110	25.7
1,111	29.1
1,112	32.2
1,113	33.6
1,114	34.1
1,115	34.3
1,116	34.4
1,117	34.9
1,118	36.2
1,119	37.0
1,120	38.3
1,121	39.4
1,122	40.2
1,123	40.1
1,124	39.9
1,125	40.2
1,126	40.9
1,127	41.5
1,128	41.8
1,129	42.5
1,130	42.8
1,131	43.3
1,132	43.5
1,133	43.5
1,134	43.5
1,135	43.3
1,136	43.1
1,137	43.1
1,138	42.6
1,139	42.5
1,140	41.8
1,141	41.0
1,142	39.6
1,143	37.8
1,144	34.6
1,145	32.2
1,146	28.2
1,147	25.7
1,148	22.5
1,149	17.2
1,150	11.8
1,151	6.6
1,152	1.2
1,153	0
1,154	0
1,155	0
1,156	0
1,157	0
1,158	0
1,159	0
1,160	0
1,161	0
1,162	0
1,163	0
1,164	0
1,165	0
1,166	0
1,167	0
1,168	0
1,169	3.4
1,170	8.7
1,171	14.0
1,172	19.3
1,173	24.6
1,174	29.9
1,175	34.0
1,176	37.0
1,177	37.8
1,178	37.0
1,179	36.2
1,180	32.2
1,181	26.5
1,182	21.6

Time (seconds):	Speed (kilometres per hour)
1,183	16.3
1,184	10.9
1,185	5.6
1,186	0.2
1,187	0
1,188	0
1,189	0
1,190	0
1,191	0
1,192	0
1,193	0
1,194	0
1,195	0
1,196	0
1,197	0.3
1,198	2.4
1,199	5.6
1,200	10.5
1,201	15.8
1,202	19.3
1,203	20.8
1,204	20.9
1,205	20.3
1,206	20.6
1,207	21.1
1,208	21.1
1,209	22.5
1,210	24.9
1,211	27.4
1,212	29.9
1,213	31.7
1,214	33.8
1,215	34.6
1,216	35.1
1,217	35.1
1,218	34.6
1,219	34.1
1,220	34.6
1,221	35.1
1,222	35.4
1,223	35.2
1,224	34.9
1,225	34.6
1,226	34.6
1,227	34.4
1,228	32.3
1,229	31.4
1,230	30.9

Time (seconds):	Speed (kilometres per hour)
1,231	31.5
1,232	31.9
1,233	32.2
1,234	31.4
1,235	29.2
1,236	24.9
1,237	20.2
1,238	16.1
1,239	12.9
1,240	8.7
1,241	6.4
1,242	4.6
1,243	1.1
1,244	0
1,245	0
1,246	0
1,247	0
1,248	0
1,249	0
1,250	0
1,251	0
1,252	1.6
1,253	1.6
1,254	1.6
1,255	1.6
1,256	1.6
1,257	2.6
1,258	4.8
1,259	6.4
1,260	8.0
1,261	10.1
1,262	12.9
1,263	16.1
1,264	16.9
1,265	15.3
1,266	13.7
1,267	13.2
1,268	14.2
1,269	17.7
1,270	22.5
1,271	27.4
1,272	31.4
1,273	33.8
1,274	35.1
1,275	35.7
1,276	37.0
1,277	38.0
1,278	38.8

Time (seconds):	Speed (kilometres per hour)
1279	39.4
1280	39.4
1281	38.6
1282	37.8
1283	37.8
1284	37.8
1,285	37.8
1,286	37.8
1,287	37.8
1,288	38.6
1,289	38.8
1,290	39.4
1,291	39.8
1,292	40.2
1,293	40.8
1,294	41.2
1,295	41.4
1,296	41.8
1,297	42.2
1,298	43.5
1,299	44.7
1,300	45.5
1,301	46.7
1,302	46.8
1,303	46.7
1,304	45.1
1,305	39.8
1,306	34.4
1,307	29.1
1,308	23.8
1,309	18.5
1,310	13.2
1,311	7.9
1,312	2.6
1,313	0
1,314	0
1,315	0
1,316	0
1,317	0
1,318	0
1,319	0
1,320	0
1,321	0
1,322	0
1,323	0
1,324	0
1,325	0
1,326	0

Time (seconds):	Speed (kilometres per hour)
1,327	0
1,328	0
1,329	0
1,330	0
1,331	0
1,332	0
1,333	0
1,334	0
1,335	0
1,336	0
1,337	0
1,338	2.4
1,339	7.7
1,340	13.0
1,341	18.3
1,342	21.2
1,343	24.3
1,344	27.0
1,345	29.5
1,346	31.4
1,347	32.7
1,348	34.3
1,349	35.2
1,350	35.6
1,351	36.0
1,352	35.4
1,353	34.6
1,354	34.0
1,355	33.0
1,356	32.2
1,357	31.5
1,358	30.6
1,359	28.2
1,360	26.6
1,361	24.9
1,362	22.5
1,363	17.7
1,364	12.9
1,365	8.4
1,366	4.0
1,367	0
1,368	0
1,369	0
1,370	0
1,371	0

(c) EPA Urban Dynamometer Driving Schedule for motorcycles with engine displacements less than 170 cc (10.4 cu. in.).

Speed Versus Time Sequence

Time (seconds):	Speed (kilometres per hour)
1	0
2	0
3	0
4	0
5	0
6	0
7	0
8	0
9	0
10	0
11	0
12	0
13	0

Time (seconds):	Speed (kilometres per hour)
14	0
15	0
16	0
17	0
18	0
19	0
20	0
21	4.8
22	9.5
23	13.8
24	18.5
25	23.0
26	27.3

Time (seconds):	Speed (kilometres per hour)
27	27.8
28	29.1
29	33.3
30	34.9
31	36.0
32	36.2
33	35.6
34	34.6
35	33.6
36	32.8
37	31.9
38	27.4
39	24.0

Time (seconds):	Speed (kilometres per hour)
40	24.0
41	24.5
42	24.9
43	25.7
44	27.5
45	30.7
46	34.0
47	36.5
48	36.9
49	36.8
50	36.4
51	34.3
52	30.4

Time (seconds):	Speed (kilometres per hour)
83	37.8
84	38.4
85	38.4
86	38.5
87	31.9
88	34.8
89	37.3
90	38.9
91	39.0
92	40.1
93	40.2
94	39.6
95	39.4
96	39.8
97	39.9
98	39.8
99	39.6
100	39.6
101	40.4
102	41.2
103	41.4
104	40.9
105	40.1
106	40.2
107	40.6
108	41.6
109	41.6
110	41.4
111	42.0
112	43.0
113	44.3
114	46.0
115	47.2
116	48.0
117	48.4
118	48.9
119	49.4
120	49.4
121	49.1
122	48.9
123	48.8
124	48.9
125	48.9
126	48.9
127	48.1
128	47.5
129	48.0
130	48.8
131	49.4
132	49.7
133	49.9
134	49.7
135	48.9
136	48.9
137	48.1
138	48.6
139	48.4
140	50.3
141	51.3
142	51.6
143	52.1
144	51.8
145	51.8
146	49.9
147	48.7
148	46.4
149	35.4
150	30.1
151	24.8
152	19.5
153	14.3
154	8.9
155	3.6
156	0
157	0
158	0
159	0
160	0
161	0
162	0
163	0
164	0
165	0
166	0
167	0
168	0
169	0
170	0
171	0
172	0
173	0
174	0
175	0
176	0
177	0
178	0
179	0
180	0
181	0
182	0
183	0
184	0
185	0
186	0
187	0
188	0
189	0
190	0
191	0
192	0
193	0
194	0
195	0
196	0
197	0
198	0
199	0
200	0
201	0
202	0
203	0
204	0
205	0
206	0
207	0
208	0
209	0
210	0
211	0
212	0
213	0
214	0
215	0
216	0
217	0
218	0
219	0
220	0
221	3.4
222	6.8
223	10.3
224	13.7
225	17.1
226	20.6
227	23.9
228	25.2
229	26.7
230	27.4
231	26.6
232	26.0
233	25.6
234	25.9
235	26.1
236	26.2
237	26.7
238	28.2
239	27.5
240	24.9
241	23.5
242	20.1
243	16.8
244	17.8
245	18.8
246	19.3
247	20.7
248	25.4
249	28.2
250	31.6
251	34.4
252	36.9
253	39.0
254	40.7
255	42.0
256	43.0
257	43.6
258	44.1
259	44.5
260	44.8
261	45.1
262	45.3
263	45.4
264	45.5
265	45.6
266	45.7
267	45.8
268	45.8
269	45.8
270	45.8
271	45.8
272	45.8
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760	45.8
761	45.8
762	45.8
763	45.8
764	45.8
765	45.8
766	45.8
767	45.8
768	45.8
769	45.8
770	45.8
771	45.8
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773	45.8
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775	45.8
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781	45.8
782	45.8
783	45.8
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785	45.8
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790	45.8
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797	45.8
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801	45.8
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807	45.8
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809	45.8
810	45.8
811	45.8
812	45.8
813	45.8
814	45.8
815	45.8
816	45.8
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818	45.8
819	45.8
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840	45.8
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845	45.8
846	45.8
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863	45.8
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891	45.8
892	45.8
893	45.8
894	45.8
895	45.8
896	45.8
897	45.8
898	45.8
899	45.8
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903	45.8
904	45.8
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913	45.8
914	45.8
915	45.8
916	45.8
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918	45.8
919	45.8
920	45.8
921	45.8
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923	45.8
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926	45.8
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929	45.8
930	45.8
931	45.8
932	45.8
933	45.8
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936	45.8
937	45.8
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967	45.8
968	45.8
969	45.8
970	45.8
971	45.8
972	45.8
973	45.8
974	45.8
975	45.8
976	45.8
977	45.8
978	45.8
979	45.8
980	45.8
981	45.8
982	45.8
983	45.8
984	45.8
985	45.8
986	45.8
987	45.8
988	45.8
989	45.8
990	45.8
991	45.8
992	45.8
993	45.8
994	45.8
995	45.8
996	45.8
997	45.8
998	45.8
999	45.8
1000	45.8
1001	45.8
1002	45.8
1003	45.8
1004	45.8
1005	45.8
1006	45.8
1007	45.8
1008	45.8
1009	45.8
1010	45.8
1011	45.8
1012	45.8
1013	45.8
1014	45.8
1015	45.8
1016	45.8
1017	45.8
1018	45.8
1019	45.8
1020	45.8
1021	45.8
1022	45.8
1023	45.8
1024	45.8
1025	45.8
1026	45.8
1027	45.8
1028	45.8
1029	45.8
1030	45.8
1031	45.8
1032	45.8
1033	45.8
1034	45.8
1035	45.8
1036	45.8
1037	45.8
1038	45.8
1039	45.8
1040	45.8
1041	45.8
1042	45.8
1043	45.8
1044	45.8
1045	45.8
1046	45.8
1047	45.8
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1049	45.8
1050	45.8
1051	45.8
1052	45.8
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1057	45.8
1058	45.8
1059	45.8
1060	45.8
1061	45.8
1062	45.8
1063	45.8
1064	45.8
1065	45.8
1066	45.8
1067	45.8
1068	45.8
1069	45.8
1070	45.8
1071	45.8
1072	45.8
1073	45.8
1074	45.8
1075	45.8
1076	45.8
1077	45.8
1078	45.8
1079	45.8
1080	45.8
1081	45.8
1082	45.8
1083	45.8
1084	45.8
1085	45.8
1086	45.8
1087	45.8
1088	45.8
1089	45.8
1090	45.8
1091	45.8
1092	45.8
1093	45.8
1094	45.8
1095	45.8
1096	45.8
1097	45.8
1098	45.8
1099	45.8
1100	45.8
1101	45.8
1102	45.8
1103	45.8
1104	45.8
1105	45.8
1106	45.8
1107	45.8
1108	45.8
1109	45.8
1110	45.8
1111	45.8
1112	45.8
1113	45.8
1114	45.8
1115	45.8
1116	45.8
1117	45.8
1118	45.8
1119	45.8
1120	45.8
1121	45.8
1122	45.8
1123	45.8
1124	45.8
1125	45.8
1126	45.8
1127	45.8
1128	45.8
1129	45.8
1130	45.8
1131	45.8
1132	45.8
1133	45.8
1134	45.8
1135	45.8
1136	45.8
1137	45.8
1138	45.8
1139	45.8
1140	45.8
1141	45.8
1142	45.8
1143	45.8
1144	45.8
1145	45.8
1146	45.8
1147	45.8
1148	45.8
1149	45.8
1150	45.8
1151	45.8
1152	45.8
1153	45.8
1154	45.8
1155	45.8
1156	45.8
1157	45.8
1158	45.8
1159	45.8
1160	45.8
1161	45.8
1162	45.8
1163	45.8
1164	45.8
1165	45.8
1166	45.8
1167	45.8
1168	45.8
1169	45.8
1170	45.8
1171	45.8
1172	45.8
1173	45.8
1174	45.8
1175	45.8
1176	45.8
1177	45.8
1178	45.8
1179	45.8
1180	45.8
1181	45.8
1182	45.8
1183	45.8
1184	45.8
1185	45.8
1186	45.8
1187	45.8
1188	45.8
1189	45.8
1190	45.8
1191	45.8
1192	45.8
1193	45.8
1194	45.8
1195	45.8
1196	45.8
1197	45.8
1198	45.8
1199	45.8
1200	45.8

Time (seconds):	Speed (kilometres per hour)
389	37.9
390	32.7
391	28.2
392	23.3
393	19.3
394	14.0
395	8.7
396	3.4
397	0
398	0
399	0
400	0
401	0
402	0
403	4.2
404	9.5
405	14.8
406	20.1
407	25.4
408	30.7
409	36.0
410	40.2
411	41.2
412	44.3
413	46.7
414	48.3
415	48.4
416	48.3
417	47.8
418	47.2
419	46.3
420	45.1
421	40.2
422	34.9
423	29.6
424	24.3
425	19.0
426	13.7
427	8.4
428	3.1
429	0
430	0
431	0
432	0
433	0
434	0
435	0
436	0
437	0
438	0
439	0
440	0
441	0
442	0
443	0
444	0
445	0
446	0
447	0
448	5.2
449	10.6
450	15.9
451	21.2
452	26.6
453	31.9
454	37.2
455	42.5
456	44.7
457	46.8
458	50.7
459	53.1
460	54.1
461	56.0
462	56.5
463	57.3
464	58.1
465	57.9
466	58.1
467	58.3
468	57.9
469	57.8
470	57.9
471	57.9
472	57.2

Time (seconds):	Speed (kilometres per hour)
473	57.1
474	57.0
475	56.6
476	56.6
477	56.6
478	56.6
479	56.6
480	56.6
481	56.3
482	56.5
483	56.6
484	57.1
485	56.6
486	56.3
487	56.3
488	56.3
489	56.0
490	55.7
491	55.5
492	53.9
493	51.6
494	48.4
495	45.1
496	41.0
497	36.2
498	31.9
499	26.6
500	21.3
501	16.0
502	11.6
503	6.4
504	1.6
505	0
506	0
507	0
508	0
509	0
510	0
511	1.9
512	5.6
513	8.9
514	10.5
515	13.7
516	15.4
517	16.9
518	19.2
519	22.5
520	25.7
521	28.5
522	30.6
523	32.3
524	33.8
525	35.4
526	37.0
527	38.3
528	39.4
529	40:1
530	40.2
531	40.2
532	40.2
533	40.2
534	40.2
535	40.2
536	41.2
537	41.5
538	41.8
539	41.2
540	40.6
541	40.2
542	40.2
543	40.2
544	39.3
545	37.2
546	31.9
547	26.6
548	21.3
549	15.9
550	10.6
551	5.3
552	0
553	0
554	0
555	0
556	0

Time (seconds):	Speed (kilometres per hour)
557	0
558	0
559	0
560	0
561	0
562	0
563	0
564	0
565	0
566	0
567	0
568	0
569	5.2
570	10.6
571	15.9
572	20.9
573	23.5
574	25.7
575	27.4
576	27.4
577	27.4
578	28.2
579	28.5
580	28.5
581	28.2
582	27.4
583	27.2
584	26.7
585	27.4
586	27.5
587	27.4
588	26.7
589	26.6
590	26.6
591	26.7
592	27.4
593	28.2
594	29.8
595	30.9
596	32.5
597	33.8
598	34.0
599	34.1
600	34.8
601	35.4
602	36.0
603	36.2
604	36.2
605	36.2
606	36.5
607	38.1
608	40.4
609	41.8
610	42.6
611	43.5
612	42.0
613	36.7
614	31.4
615	26.1
616	20.8
617	15.4
618	10.1
619	4.8
620	0
621	0
622	0
623	0
624	0
625	0
626	0
627	0
628	0
629	0
630	0
631	0
632	0
633	0
634	0
635	0
636	0
637	0
638	0
639	0
640	0

Time (seconds):	Speed (kilometres per hour)
641	0
642	0
643	0
644	0
645	0
646	3.2
647	7.2
648	12.6
649	16.4
650	20.1
651	22.5
652	24.6
653	28.2
654	31.5
655	33.8
656	35.7
657	37.5
658	39.4
659	40.7
660	41.2
661	41.8
662	42.0
663	42.2
664	42.2
665	42.5
666	42.6
667	42.6
668	41.8
669	41.0
670	38.0
671	34.4
672	29.8
673	26.4
674	23.3
675	18.7
676	14.8
677	9.3
678	5.6
679	3.2
680	0
681	0
682	0
683	0
684	0
685	0
686	0
687	0
688	0
689	0
690	0
691	0
692	0
693	0
694	2.3
695	5.3
696	7.1
697	10.5
698	14.8
699	18.2
700	21.7
701	23.5
702	26.4
703	26.9
704	26.6
705	26.6
706	29.3
707	30.9
708	32.3
709	34.6
710	36.2
711	36.2
712	35.6
713	36.5
714	37.5
715	37.8
716	36.2
717	34.8
718	33.0
719	29.0
720	24.1
721	19.3
722	14.8
723	10.0
724	7.2

Time (seconds):	Speed (kilometres per hour)
726	4.8
726	8.6
727	0.8
728	0.8
729	5.1
730	10.5
731	15.4
732	20.1
733	22.5
734	25.7
735	28.0
736	31.5
737	34.8
738	37.2
739	39.4
740	41.0
741	42.6
742	43.6
743	44.4
744	44.9
745	45.5
746	46.0
747	46.0
748	45.5
749	45.4
750	45.1
751	44.3
752	43.1
753	41.0
754	37.8
755	34.6
756	30.8
757	26.6
758	24.0
759	20.1
760	15.1
761	10.0
762	4.8
763	2.4
764	2.4
765	0.8
766	0
767	4.8
768	10.1
769	15.4
770	20.8
771	25.4
772	28.2
773	29.6
774	31.4
775	33.3
776	35.4
777	37.3
778	40.2
779	42.6
780	44.3
781	45.1
782	45.5
783	46.5
784	46.5
785	46.5
786	46.3
787	45.9
788	45.5
789	45.5
790	45.5
791	45.4
792	44.4
793	44.3
794	44.3
795	44.3
796	44.3
797	44.3
798	44.3
799	44.4
800	45.1
801	45.9
802	48.3
803	49.8
804	51.5
805	53.1
806	53.1
807	54.1
808	54.7

Time (seconds):	Speed (kilometres per hour)
809	55.2
810	55.6
811	54.7
812	54.7
813	54.6
814	54.1
815	53.3
816	53.1
817	52.3
818	51.5
819	51.3
820	50.9
821	50.7
822	49.3
823	48.3
824	48.1
825	48.1
826	48.1
827	48.1
828	47.6
829	47.5
830	47.5
831	47.2
832	46.6
833	45.4
834	44.6
835	43.5
836	41.0
837	38.1
838	35.4
839	33.0
840	30.8
841	30.9
842	32.3
843	33.6
844	34.4
845	35.4
846	36.4
847	37.3
848	38.6
849	40.3
850	41.8
851	42.8
852	42.8
853	43.1
854	43.5
855	43.8
856	44.7
857	45.2
858	46.3
859	46.5
860	46.7
861	46.8
862	46.7
863	45.2
864	44.3
865	43.5
866	41.5
867	40.3
868	39.4
869	38.9
870	40.4
871	41.0
872	41.4
873	42.2
874	43.3
875	44.3
876	44.7
877	45.7
878	46.7
879	47.0
880	46.8
881	46.7
882	46.5
883	45.9
884	45.2
885	45.1
886	45.1
887	44.4
888	43.8
889	42.8
890	43.8
891	44.3
892	44.7

Time (seconds):	Speed (kilometres per hour)
893	45.1
894	44.7
895	45.1
896	45.1
897	45.1
898	44.6
899	44.1
900	43.3
901	42.8
902	43.8
903	42.6
904	42.6
905	43.3
906	43.2
907	43.3
908	41.7
909	41.2
910	41.3
911	41.7
912	41.5
913	41.0
914	39.6
915	37.8
916	35.7
917	34.8
918	34.8
919	34.8
920	36.4
921	37.7
922	38.6
923	38.9
924	39.3
925	40.1
926	40.4
927	40.6
928	40.7
929	41.0
930	40.6
931	40.2
932	40.2
933	40.2
934	39.8
935	39.4
936	39.1
937	39.1
938	39.4
939	40.2
940	40.2
941	39.6
942	39.6
943	38.8
944	39.4
945	40.4
946	41.2
947	40.4
948	38.6
949	35.4
950	32.3
951	27.2
952	21.9
953	16.6
954	11.3
955	6.0
956	0.6
957	0
958	0
959	0
960	3.2
961	8.5
962	13.8
963	19.2
964	24.5
965	28.2
966	29.9
967	32.2
968	34.0
969	35.4
970	37.0
971	39.4
972	42.3
973	44.3
974	45.2
975	46.7

Time (seconds):	Speed (kilometres per hour)
976	46.9
977	46.9
978	46.9
979	46.6
980	46.3
981	43.8
982	43.1
983	42.8
984	41.8
985	41.6
986	40.6
987	38.6
988	38.4
989	34.6
990	34.6
991	35.1
992	36.2
993	37.0
994	36.7
995	36.7
996	37.0
997	36.5
998	36.5
999	36.5
1,000	37.6
1,001	38.6
1,002	39.6
1,003	39.9
1,004	40.4
1,005	41.6
1,006	41.2
1,007	41.0
1,008	40.2
1,009	38.8
1,010	36.1
1,011	37.3
1,012	36.9
1,013	36.2
1,014	35.4
1,015	34.8
1,016	33.8
1,017	28.2
1,018	22.9
1,019	17.5
1,020	12.2
1,021	6.9
1,022	1.6
1,023	0
1,024	0
1,025	0
1,026	0
1,027	0
1,028	0
1,029	0
1,030	0
1,031	0
1,032	0
1,033	0
1,034	0
1,035	0
1,036	0
1,037	0
1,038	0
1,039	0
1,040	0
1,041	0
1,042	0
1,043	0
1,044	0
1,045	0
1,046	0
1,047	0
1,048	0
1,049	0
1,050	0
1,051	0
1,052	0
1,053	1.9
1,054	6.4
1,055	11.7
1,056	17.1
1,057	22.4
1,058	27.6

Time (seconds):	Speed (kilometres per hour)
1,060	29.8
1,060	33.2
1,061	35.1
1,062	37.0
1,063	38.6
1,064	39.9
1,065	41.2
1,066	42.6
1,067	43.1
1,068	44.1
1,069	44.9
1,070	45.5
1,071	46.1
1,072	44.3
1,073	43.5
1,074	43.5
1,075	42.3
1,076	39.4
1,077	36.2
1,078	34.6
1,079	33.2
1,080	29.0
1,081	24.1
1,082	19.8
1,083	17.9
1,084	17.1
1,085	16.1
1,086	15.3
1,087	14.6
1,088	14.0
1,089	13.8
1,090	14.2
1,091	14.6
1,092	14.0
1,093	13.8
1,094	12.9
1,095	11.3
1,096	8.0
1,097	6.8
1,098	4.2
1,099	1.6
1,100	0.9
1,101	0.2
1,102	1.0
1,103	2.6
1,104	5.8
1,105	11.1
1,106	16.1
1,107	20.6
1,108	22.5
1,109	23.3
1,110	25.7
1,111	29.1
1,112	32.2
1,113	33.8
1,114	34.1
1,115	34.3
1,116	34.4
1,117	34.9
1,118	36.2
1,119	37.0
1,120	38.3
1,121	39.4
1,122	40.2
1,123	40.1
1,124	39.9
1,125	40.2
1,126	40.9
1,127	41.6
1,128	41.8
1,129	42.5
1,130	42.8
1,131	43.3
1,132	43.5
1,133	43.5
1,134	43.5
1,135	43.3
1,136	43.1
1,137	43.1
1,138	42.9
1,139	42.5
1,140	41.8
1,141	41.0
1,142	39.6
1,143	37.6
1,144	34.6
1,145	32.2
1,146	28.2
1,147	25.7
1,148	22.5
1,149	17.2
1,150	11.9
1,151	6.6
1,152	1.3
1,153	0
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1,155	0
1,156	0
1,157	0
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1,161	0
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1,163	0
1,164	0
1,165	0
1,166	0
1,167	0
1,168	0
1,169	2.4
1,170	8.7
1,171	14.0
1,172	19.3
1,173	24.6
1,174	29.9
1,175	34.0
1,176	37.0
1,177	37.8
1,178	37.0
1,179	36.2
1,180	32.2
1,181	26.9
1,182	21.6
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1,184	10.9
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1,189	0
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1,911	0
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1,193	0.0
1,194	0.0
1,195	0.0
1,196	0.0
1,197	0.3
1,198	2.4
1,199	5.6
1,200	10.5
1,201	15.8
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1,203	20.6
1,204	20.9
1,205	20.8
1,206	20.6
1,207	21.1
1,208	21.1
1,209	22.5
1,210	24.9
1,211	27.4
1,212	29.9
1,213	31.7
1,214	33.8
1,215	34.6
1,216	35.1
1,217	35.1
1,218	34.6
1,219	34.1
1,220	34.6
1,221	35.1
1,222	35.4
1,223	35.2
1,224	34.9
1,225	34.6
1,226	34.6
1,227	34.4
1,228	33.3
1,229	31.4
1,230	30.8
1,231	31.5
1,232	31.9
1,233	32.2
1,234	31.4
1,235	28.2
1,236	24.9
1,237	20.9
1,238	16.1
1,239	12.9
1,240	9.7
1,241	6.4
1,242	4.0
1,243	1.1
1,244	0
1,245	0
1,246	0
1,247	0
1,248	0
1,249	0
1,250	0
1,251	0
1,252	1.6
1,253	1.6
1,254	1.6
1,255	1.6
1,256	1.6
1,257	2.6
1,258	4.8
1,259	6.4
1,260	8.0
1,261	10.1
1,262	12.9
1,263	16.1
1,264	16.9
1,265	16.3
1,266	15.7
1,267	12.2
1,268	14.2
1,269	17.7
1,270	22.5
1,271	27.4
1,272	31.4
1,273	33.8
1,274	35.1
1,275	35.7
1,276	37.0
1,277	38.0
1,278	38.8
1,279	39.4
1,280	39.4
1,281	38.6
1,282	37.8
1,283	37.8
1,284	37.8
1,285	37.8
1,286	37.8
1,287	37.8
1,288	38.6
1,289	38.8
1,290	39.4
1,291	39.8
1,292	40.2
1,293	40.9
1,294	41.2
1,295	41.4
1,296	41.8
1,297	42.2
1,298	43.8
1,299	44.7
1,300	45.5
1,301	46.7
1,302	46.8
1,303	46.7
1,304	45.1
1,305	39.8
1,306	34.4
1,307	29.1
1,308	23.8
1,309	18.5
1,310	13.2
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1,312	2.6
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1,316	0
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1,320	0
1,321	0
1,322	0
1,323	0
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1,330	0
1,334	0
1,335	0
1,336	0
1,337	0
1,338	2.4
1,339	7.7
1,340	13.0
1,341	18.3
1,342	21.2
1,343	24.3
1,344	27.0
1,345	29.8
1,346	31.4
1,347	32.7
1,348	34.3
1,349	35.2
1,350	35.6
1,351	36.0
1,352	35.4
1,353	34.8
1,354	34.0
1,355	33.0
1,356	32.2
1,357	31.5
1,358	29.8
1,359	28.2
1,360	26.6
1,361	24.9
1,362	22.5
1,363	17.7
1,364	12.9
1,365	8.4
1,366	4.0
1,367	0
1,368	0
1,369	0
1,370	0
1,371	0

Appendix II—Procedure for Dynamometer Road Horsepower Calibration

This appendix describes the method for determining the road horsepower absorbed by a chassis dynamometer. The measured absorbed road horsepower includes the dynamometer friction as well as the power absorbed by the power absorption unit. The dynamometer is driven above the test speed range. The device used to drive the dynamometer is then disengaged from the dynamometer and the roll(s) is allowed to coast down. The kinetic energy of the system is dissipated by the dynamometer friction and absorption unit. This method neglects the variations in roll bearing friction due to the drive axle weight of the vehicle. The difference in coast down time of the free (rear) roll relative to the drive (front) roll may be neglected in the case of dynamometers with paired rolls.

These procedures shall be followed:

1. Devise a method to determine the speed of the drive roll if not already measured. A fifth wheel, revolution pickup or other suitable means may be used.

2. Place a vehicle on the dynamometer or devise another method of driving the dynamometer.

3. Engage inertia flywheel for the most common vehicle weight class for which the dynamometer is used.

4. Drive dynamometer up to 50 m.p.h.

5. Record indicated road horsepower.

6. Drive dynamometer up to 60 m.p.h.

7. Disengage the device used to drive the dynamometer.

8. Record the time for the dynamometer drive roll to coast down from 55 m.p.h. to 45 m.p.h.

9. Adjust the power absorption unit to a different level.

10. Repeat steps 4 to 9 above sufficient times to cover the range of road horsepower used.

11. Calculate absorbed road horsepower from:

$HP_d=(1/2)\,(W_i/32.2)\quad(V_1^2-V_2^2)/(550t)$

$HP_d=0.06073\,(W_i/t)$

Where:

W_i=Equivalent inertia in lb.

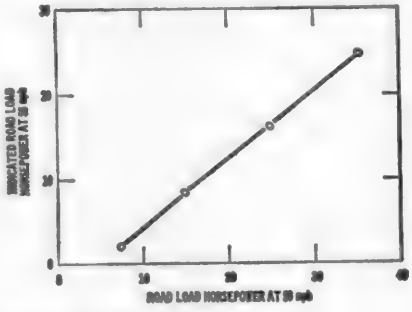
V_1=Initial velocity in ft./sec. (55 m.p.h. =80.67ft./sec.).

V_2=Final velocity in ft./sec. (45 m.p.h. =66 ft./sec.).

t=Elapsed time for rolls to coast from 55 m.p.h. to 45 m.p.h.

12. Plot indicated road load horsepower at 50 m.p.h. versus road load horsepower at 50 m.p.h.

13. The road load horsepower reported in § 86.177–11 is obtained by entering the plot at the indicated road load horsepower determined in § 86.177–(e)(1).



EXAMPLE: Dynamometer calibration curve
[Sec. No. 86-204-76 F-01-00]

14. Once the road load horsepower at 50 m.p.h. is known for a vehicle, it may be tested on other dynamometers using a similar calibration.

Appendix III—Constant Volume Sampler Flow Calibration

The following calibration procedure outlines the equipment, the test setup configuration, and the various parameters which must be measured to establish the flow rate of the constant volume sampler pump. All the parameters related to the pump are simultaneously measured with the parameters related to a flowmeter which is connected in series with the pump. The calculated flow rate (ft^3/rev @ pump inlet absolute pressure and temperature) can then be plotted versus a correlation function which is the value of a specific combination of pump parameters. The linear equation which relates the pump flow and the correlation function is then determined. In the event that a CVS has a multiple speed drive, a calibration for each range should be performed.

This calibration procedure is based on the measurement of the absolute values of the pump and flowmeter parameters that relate the flow rate at each point. Three conditions must be maintained to assure the accuracy and integrity of the calibration curve. First, the pump pressures should be measured at

taps on the pump rather than at the external piping on the pump inlet and outlet. Pressure taps that are mounted at the top and bottom center of the pump drive headplate are exposed to the actual pump cavity pressures, and therefore reflect the absolute pressure differentials. Secondly, temperature stability must be maintained during the calibration. The laminar flowmeter is sensitive to inlet temperature oscillations which cause the data points to be scattered. Gradual changes (± 2°F) in temperature are acceptable as long as they occur over a period of several minutes. Finally, all connections between the flowmeter and the CVS pump must be absolutely void of any leakage.

During a CVS emissions test the measurement of these same pump parameters enables the user to calculate the flow rate from the calibration equation.

After the calibration curve has been obtained, a verification test of the entire system can be performed by injecting a known mass of gas into the system and comparing the mass indicated by the system to the true mass injected. An indicated error does not necessarily mean that the calibration is wrong, since other factors can influence the accuracy of the system.

Equipment:

The following list of equipment will be needed to perform this calibration procedure. Figure 1 illustrates a typical equipment arrangement used for calibration. All of the equipment involved should conform to the range and accuracy as specified in Figure 1.

Equipment List:

1. LFE—Laminar Flowmeter
2. Micromanometer
3. Thermometer
4. Timer
5. U-Tube Manometers
6. Temperature Indicator with type J Thermocouples
7. A variable flow restrictor with appropriate piping to connect the CVS pump and LFE.

After the system has been connected as shown in Figure 1, set the variable restrictor in the wide open position and run the CVS pump for twenty minutes. Record the calibration data.

CALIBRATION DATA MEASUREMENTS

Parameter	Symbol	Units	Tolerance
Barometric pressure (corrected)	P_B	"Hg	±.01 "Hg.
Ambient temperature	T_A	°F	±.5° F.
Air Temperature into LFE	ETI	°F	±.1° F.
Pressure depression upstream of LFE	EPI	"H20	±.1"H20.
Pressure drop across the LFE matrix	EDP	"H20	±.005"H20.
Air temperature at CVS pump inlet	PTI	°F	±.5° F.
Pressure depression at CVS pump inlet	PPI	"Fluid	±.05"Fluid.
Specific gravity of manometer fluid	Sp. Gr.		
Pressure head at CVS pump outlet	PPO	"Fluid	±.05"Fluid.
Air temperature at CVS pump outlet (optional)	PTO	°F	±.5° F.
Pump revolutions during test period	N	Revs	None.
Elapsed time for test period	t	Seconds	±.05 Seconds.

Note.—The fluid level in the manometer tube should stabilize before the reading is made and the elapsed time for revolution counting should be greater than 120 seconds.

Reset the restrictor valve to a more restricted condition in an increment of pump inlet depression (aout 4" H_2O) that will yield a minimum of six data points for the total calibration.

Allow the system to stabilize for 3 minutes and repeat the data acquisition.

Data Analysis:

The data recorded during the calibration are to be used in the following calculations.

1. The air flow rate at each test point is calculated in standard cubic feet per minute (Q_s) from the flowmeter data using the manufacturer's prescribed method.

2. The air flow rate is then converted to pump flow, V_o, in cubic feet per revolution at absolute pump inlet temperature and pressure.

$$V_o = \frac{Q_s}{n} \times \frac{T_p}{530} \times \frac{29.92}{P_p}$$

Where:

Q_s=Meter air flow rate in standard cubic feet per minute (flowmeter standard conditions are 70°F, 29.92 "Hg).

n=Pump speed in revolutions per minute.

P_p=Absolute pump inlet pressure, in ("Hg).

$P_p = P_B - PPI$ (SP.GR./13.57), $T_p = PTI + 460$.

3. The correlation function at each test point is then calculated from the calibration data, as follows:

$$X_o = \frac{1}{n}\sqrt{\frac{\Delta P_p}{P_e}}$$

ΔP_p=The pressure differential from pump inlet to pump outlet in ("Hg).

$$\Delta P_p = P_e - P_p$$

P_e=Absolute pump outlet pressure, in ("Hg).

$$P_e = P_B + PPO \text{ (Sp. Gr./13.57)}$$

See § 86.177–22 for other definitions.

4. A linear least squares fit is performed to generate the calibration equations which have the forms

$$V_o = D_o - M(X_o)$$
$$n = A - B(\Delta P_p)$$

Do, M, A, and B are the slope-intercept constants describing the lines.

A CVS system that has multiple speeds should be calibrated on each speed used. The calibration curves generated for the ranges will be approximately parallel and the intercept values, D_o, will increase as the pump flow range decreases.

If the calibration has been performed carefully, the calculated V_o values from the equation will be within ±.50% of the measured value of V_o. Values of M will vary from one pump to another, but values of D_o for pumps of the same make, model, and range should agree within ±3 percent of each other. Particulate influx from use will cause the pump slip to decrease as reflected by lower values for M. Calibrations should be performed at 0, 50, 100, 200, 400, etc. hours of pump operation to assure the stability of the pump slip rate. Analysis of mass injection data will also reflect pump slip stability.

CVS System Verification:

The following technique can be used to verify that the CVS and analytical instruments can accurately measure a mass of gas that has been injected into the system.

1. Obtain a small cylinder that has been charged with pure propane or carbon monoxide gas (caution—carbon monoxide is poisonous!). Critical flow orifice devices can also be used for constant flow metering.

2. Determine a reference cylinder weight to the nearest 0.01 gram.

3. Operate the CVS in the normal manner and release a quantity of pure propane or carbon monoxide into the system during the sampling period.

4. The calculations of § 86.177–22 are performed in a normal way except, in the case of propane, the density of propane (17.30 grams/cu./ft./carbon atom) is used in place of the density of exhaust hydrocarbons. In the case of carbon monoxide, the density of 32.97 grams/cu. ft. is used.

5. The gravimetric mass is subtracted from the CVS measured mass and then divided by the gravimetric mass to determine the percent accuracy of the system.

6. The cause for any discrepancy greater than±2 percent should be found and corrected.

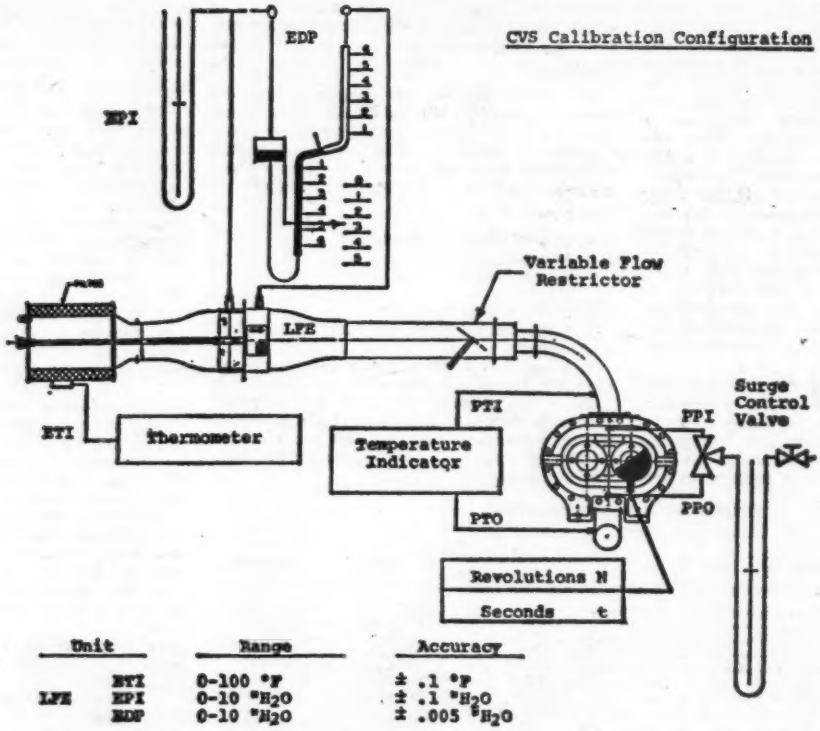
The following list of parametric errors may assist the operator in locating the cause of large errors.

Positive Error (Indication is higher than true value):

1. Calculated V_o is greater than actual V_o.
   a. Original calibration in error.
2. Pump inlet temperature recorder is reading low. A 6° F. discrepancy will give a 1 percent error.
3. Pump inlet pressure indicator is reading high. A 3.5 in. H_2O high reading will give 1 percent error.
4. Background concentration reading is too low. Check analyzer zero. Check leakage at floor inlet.
5. Analyzer is reading high. Check span.
6. Barometer reading is in error (too high). Barometric pressure reading should be gravity and temperature corrected.
7. Revolution counter is reading high (Check pump speed and counters.)
8. Mixture is stratified causing the sample to be higher than the average concentration in the mixture.

Negative Error (Indication is lower than true value):

1. Calculated V_o is less than actual V_o.
   a. Original calibration in error.
   b. Pump clearances decreased due to influx of some surface adherent material. Recalibration may be needed.
2. Pump inlet temperature recorder is reading high.
3. Pump inlet pressure indicator is reading low.
4. Background concentration reading is too high.
5. Analyzer is reading low.
6. Barometer reading is in error (too low).
7. Revolution counter is reading low.
8. There is a leak into the sampling system. Pressure check the lines and fittings on the intake side of sample transfer pumps on both the CVS and analyzer console.



Unit		Range	Accuracy
	ETI	0-100 °F	± .1 °F
LFE	EPI	0-10 "H_2O	± .1 "H_2O
	EDP	0-10 "H_2O	± .005 "H_2O
	PTI	0-250 °F	± .5 °F
	PPI	0-36 "Fluid	± .05 "Fluid
	PPO	0-36 "Fluid	± .05 "Fluid
Pump	PTO	0-250 °F	± .5 °F
	N	0-100,000	± 0
	t	0-10,000 secs.	± .05 secs.

Note: Fluid used in 36 inch manometer should extend range to at least 0-60 "H_2O. Separate manometers for PPI and PPO may be used during calibration.

Figure I—CVS Calibration Configuration

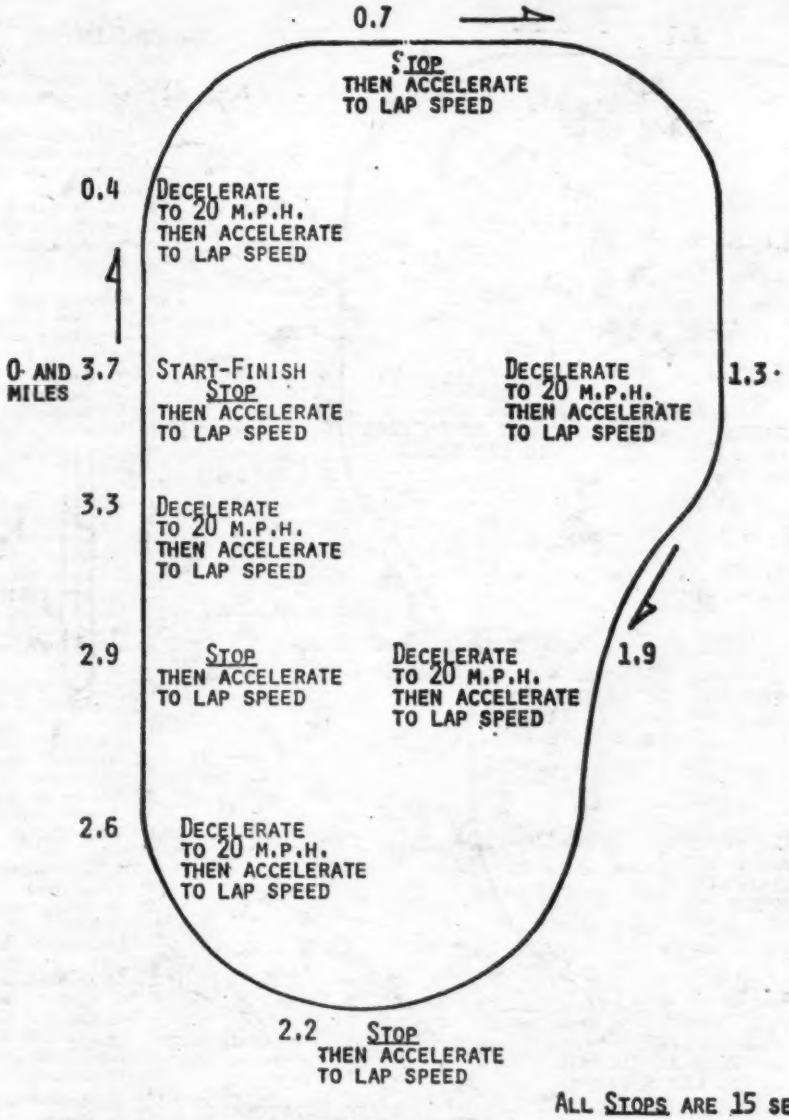
APPENDIX IV—DURABILITY DRIVING SCHEDULES

(a) Durability Driving Schedule for Light-Duty Vehicles and Light-Duty Trucks.

The schedule consists basically of 11 laps of a 3.7 mile course. The basic vehicle speed for each lap is listed below:

Lap:	*Speed miles per hour*
1	40
2	30
3	40
4	40
5	35
6	30
7	35
8	45
9	35
10	55
11	70

During each of the first nine laps there are 4 stops with 15 second idle. Normal accelerations and decelerations are used. In addition, there are 5 light decelerations each lap from the base speed to 20 m.p.h. followed by light accelerations to the base speed.



ALL STOPS ARE 15 SECONDS

The 10th lap is run at a constant speed of 55 m.p.h.

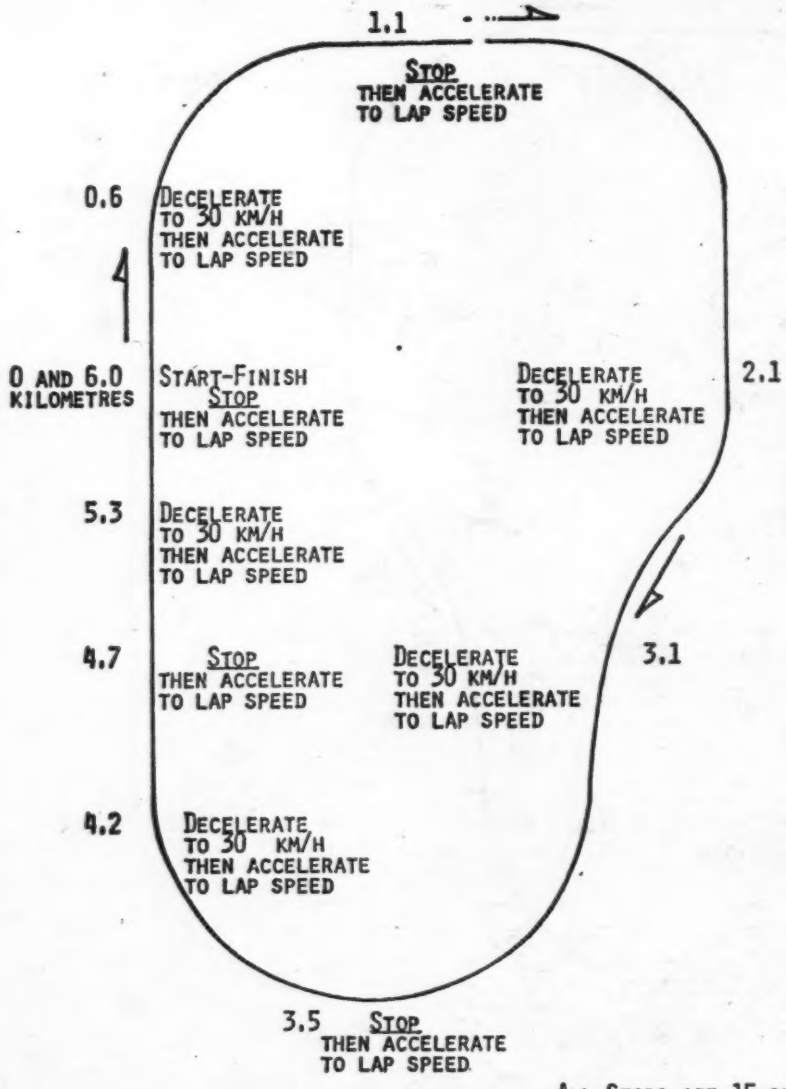
The 11th lap is begun with a wide open throttle acceleration from stop to 70 m.p.h. A normal deceleration to idle followed by a second wide open throttle acceleration occurs at the midpoint of the lap.

(b) Durability Driving Schedule for Motorcycles. The Durability Driving Schedule for Class III Motorcycles may be used for Light-Duty Vehicles and Light-Duty Trucks.

The schedule consists basically of 11 laps of a 6.0 km (3.7 mi) course. The basic vehicle speed for each lap is listed below:

Speed (kilometers per hour)

Lap	Class I	Class II	Class III
1	65	65	65
2	45	45	45
3	65	65	65
4	65	65	65
5	55	55	55
6	45	45	45
7	55	55	55
8	70	70	70
9	55	55	55
10	70	90	90
11	70	90	110



ALL STOPS ARE 15 SECONDS

During each of the first nine laps there are 4 stops with 15 second idle. Normal accelerations and decelerations are used. In addition, there are 5 light decelerations each lap from the base speed to 30 km/h followed by light accelerations to the base speed.

The 10th lap is run at a constant speed.

The 11th lap is begun with a wide open throttle acceleration from stop. A normal deceleration to idle followed by a second wide open throttle acceleration occurs at the midpoint of the lap.

This schedule may be modified with the advance approval of the Administrator if it results in unsafe operation of the vehicle.

APPENDIX V—[RESERVED]

APPENDIX VI—VEHICLE AND ENGINE COMPONENTS

(a) Light-Duty Vehicles, Light-Duty Trucks, Motorcycles, and Gasoline-Fueled Heavy-Duty Engines.

I. Basic Mechanical Components–Engine.
(1) Intake and exhaust valves.
(2) Drive belts.
(3) Manifold and cylinder head bolts.
(4) Engine oil and filter.
(5) Engine coolant.
(6) Cooling system hoses and connections.
(7) Vacuum fittings, hoses, and connections.
(8) Oil injection metering system.

II. Fuel System.
(1) Fuel specification-octane rating, lead content.
(2) Carburetor-idle RPM, mixture ratio.
(3) Choke mechanism.
(4) Fuel system filter and fuel system lines and connections.
(5) Choke plate and linkage.

III. Ignition Components.
(1) Ignition timing and advance systems.
(2) Distributor breaker points and condenser.
(3) Spark plugs.
(4) Ignition wiring.
(5) Operating parts of distributor.

IV. Crankcase Ventilation System.
(1) PCV valve.
(2) Ventilation hoses.
(3) Oil filler breather cap.
(4) Manifold inlet (carburetor spacer, etc.).

V. External Exhaust Emission Control System.
(1) Secondary air injection system hoses.
(2) Air system manifolds
(3) Control valves and air pump.
(4) Manifold reactors.
(5) Catalytic converters.
(6) Exhaust recirculation.
(7) Water injection.

VI. Evaporative Emission Control System.
(1) Engine compartment hose connections.
(2) Carbon storage media.
(3) Fuel tank pressure-relief valve operation.
(4) Fuel vapor control valves.

VII. Air Inlet Components.
(1) Carburetor air cleaner filter.
(2) Hot air control valve.

(b) Diesel Light-Duty Vehicles, Diesel Light-Duty Trucks, and Diesel Heavy-Duty Engines.

I. Engine Mechanical Components.
(1) Valve train.
(2) Cooling system.
a. Coolant.
b. Thermostat.
c. Filter.
(3) Lubrication.
a. Oil filter.
b. Lubricant.

II. Fuel System.
(1) Fuel type.
(2) Fuel pump.
(3) Fuel filters.
(4) Injectors.
(5) Governor.

III. Air Inlet Components.
(1) Air cleaner.
(2) Inlet ducting.

IV. External Exhaust Emission Control System.
(1) Rack limiting devices (aneroid, throttle delay, etc.).
(2) Manifold reactors.
(3) Catalytic converters.
(4) Exhaust recirculation.
(5) Water injection.

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